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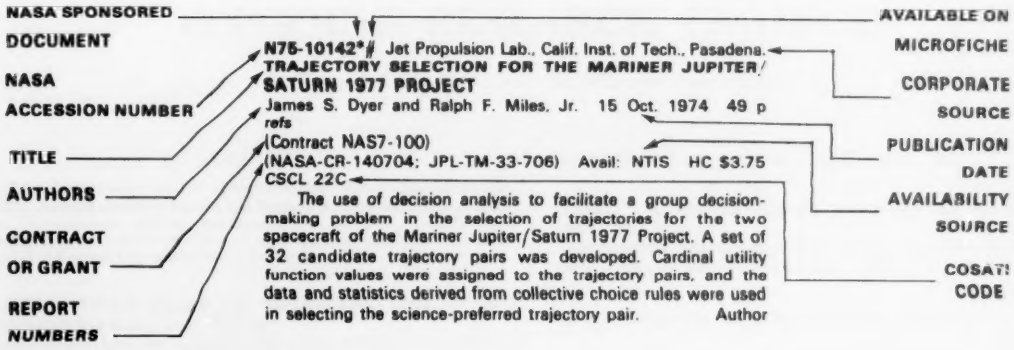
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N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY SELECTION FOR THE MARINER JUPITER/
SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p
refs
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, APPLICATION OF TRANSONIC LIFTING-LINE METHOD TO OBLIQUE WINGS
UNKNOWN, Univ. of Southern California, Graduate School, *Los Angeles, California* 90007 (NCA 2-30501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0002, TERMINAL AREA EFFECTIVENESS FOR FUTURE AIRCRAFT
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Sacramento, California* 95819 (NCA 2-55501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0003, EVALUATION STUDY FOR STOL AND VTOL AIRCRAFT
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Sacramento, California* 95819 (NCA 2-55502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0004, HANDLING AND RIDE QUALITIES OF LARGE FLEXIBLE CONTROL-CONFIGURED AIRCRAFT
R.L. SWAIM, Purdue University, School of Aeronautics, *Lafayette, Indiana* 47907 (NSG 4003)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0005, FURTHER APPLICATIONS OF A WING-JET INTERACTION THEORY
C.T. LAN, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 1139)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0006, AIRCRAFT DATA PROCESSING-SYSTEM SYNTHESIS AND SIMULATION (AADC/SPE INTERFACE)
A. DEERFIELD, Raytheon Company, *Bedford, Massachusetts* 01730 (N00014-73-C-0473)

Investigate and specify an interface of the AN/UYK-17 Signal Processing Element (SPE) for the All Applications Digital Computer (AADC).

Conduct analysis of selected AN/UYK-17 and AADC subsystem interfacing; perform architectural tradeoffs; specify an AADC subsystem to the SPE subsystem interface which satisfy objectives of both machines.

Supporting agency address information: Naval Research Laboratory (NRL 5490), Washington, D.C. 20375

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0007, COMPILATION OF FACTORS FOR COMPUTING AIRPORT DELAYS
A.R. ODONI, Mass. Inst. of Technology, Graduate Schooi, *Cambridge, Massachusetts* 02139 (NSG 1123)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0008, AVIATION SYNTHESIS PROGRAM
R.A. KROEGER, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (NSG 2056)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0009, TURBINE ENGINE DIAGNOSTIC DEVELOPMENT
P. PISCOPO, U.S. Navy, Air Propulsion Test Center, *Trenton, New Jersey* 08641

Demonstrate the feasibility of a diagnostics system which is applicable to current and future Navy aircraft that will: (a) prevent loss of aircraft due to engine associated causes by monitoring the mechanical aerothermodynamic health of the engine in real time; (b) reduce maintenance time and cost by defining the required maintenance actions down to the Line-Replaceable-Unit (LRU) level.

Develop performance, lubrication system, vibration and hot section diagnostic techniques. Develop and evaluate specialized engine sensors. develop diagnostic routines capable of identifying engine faults. Apply results of other Army, Navy, and Air Force programs where applicable. Operate diagnostic logic on a full-scale TF30 engine, incorporating faults or simulated faults to demonstrate capabilities of the system under sea level and sea level with ram conditions.

Supporting agency address information: Naval Air Systems Command Propulsion Technology Administrator, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0010, EMPIRICAL REPRESENTATION OF PARAMETRIC TURBINE ENGINE PERFORMANCE
E.G. BLEVINS, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433

This effort will attempt to develop and/or modify multi-dimensional empirical procedures to represent engine performance (thrust, airflow, fuel flow) for a matrix of engine designs. Independent or input parameters to be examined will include bypass ratio, fan pressure ratio, overall pressure ratio, altitude, Mach number and power setting.

Currently, multi-dimensional empirical procedures are being developed by aircraft manufactures to represent complex functions of several independent airframe parameters (wing loading, aspect ratio, sweep, thrust loading, etc) for some desired dependent parameter (takeoff gross weight, range, combat performance, etc.). The need for this type of development is to reduce the amount of computer time required to evaluate preliminary aircraft system performance as a function of several (8 to

17) variables. The empirical procedures, when properly applied, can reduce preliminary design computer run time by an order of magnitude. In this effort, these procedures, or modifications of them, will be examined to determine if engine performance data can be represented empirically.

Supporting agency address information: AF Aero-Propulsion Laboratory TBA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0011, AIRCRAFT MODEL PROTOTYPES WHICH HAVE SPECIFIED HANDLING-QUALITY TIME HISTORIES
S.H. JOHNSON, Lehigh University, School of Engineering, *Bethlehem, Pennsylvania* 18015 (NSG 4005)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0012, RESEARCH ON ADVANCED AIRCRAFT FIRE PREVENTION TECHNIQUES
J.M. KUCHTA, U.S. Energy Res. & Dev. Admin., Pittsburgh Energy Res. Center, *Pittsburgh, Pennsylvania* 15213

Provide consultation to the Air Force on fire or explosion problems. As a continuing effort, update safety manual prepared for aircraft accident investigators and assist in safety training symposiums.

SUPPORTED BY U.S. Energy Res. & Development Admin.

1.0013, MICROWAVE LANDING SYSTEM
A.H. LAGRONE, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: The problems of an Instrument Landing System (ILS) which depends on a ground reflected wave can largely be circumvented by a microwave landing system which, because of its high frequency, uses antennas to form a glide path independent of the ground. The problems of a Doppler system operating in the microwave frequency range is being studied.

SUPPORTED BY University of Texas

1.0014, WIND TUNNEL ENTRANCE CONTRACTION SHAPES
J.C. WESTKAEMPER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: This research is directed toward the design of the entrance contraction section of the 5 x 7 ft. 200 mph wind tunnel under construction at the Balcones Research Center. Several analytical methods are being programmed to give contours for the desired contraction ratio; these contours will be compared for flow quality and one will be selected for construction taking into consideration the difficulty of fabricating curved ducts.

SUPPORTED BY University of Texas

1.0015, EVALUATION OF SAFE ZONE ESCAPE INDICATOR CONCEPTS THROUGH DYNAMIC SIMULATOR
E.R. ATKINS, Ling Temco Vought Incorporated, *Dallas, Texas* 75222 (N62269-74-C-0523)

To develop a display system which will provide the aircrewman with sufficient information to make a timely eject decision. This contract supports work unit DK801, agency accession no. DN833218.

Perform dynamic simulation to establish display value and general presentation mode. Analyze results and prepare display equations.

Supporting agency address information: Naval Air Development Center, Crew Systems Department (401A), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0016, STRUCTURAL DYNAMICS, STABILITY AND CONTROL OF HELICOPTERS
L. MEIROVITCH, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (NSG 1114)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0017, OPTIMIZATION OF MLS RECEIVERS FOR MULTIPATH ENVIRONMENTS
G.A. MCALPINE, Univ. of Virginia, School of Engineering, *Charlottesville, Virginia* 22903 (NSG 1128)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0018, WIND TUNNEL STUDIES AND TECHNICAL EVALUATION OF ADVANCED CARGO AIRCRAFT CONCEPTS
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1135)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, IMAGE PROCESSING
R.M. BATSON, U.S. Dept. of the Interior, Geological Survey, *Flagstaff, Arizona* 86001

The image processing project is to design and develop state of the art image processing techniques for application to any digital video imagery to support geological mapping, topical geological studies, and specialized cartographic applications. The data sets involved include Mariner 4, 6, 7 and 9 imagery of Mars; Mariner 10 imagery of Venus and Mercury; Viking 75 Orbital and Lander imagery; digitized Apollo surface and orbital Hasselblad film; earth-based video color imagery of the Moon; ERTS imagery of the Earth, and Mariner-Jupiter-Saturn imagery to be obtained in 1979. A great deal of effort has been devoted within the project to developing a streamlined processing scheme for Mariner spacecraft imagery. This is to support the necessary Mariner 9, Viking, and Mariner 10 cartographic activities for Mars and Mercury. Currently the emphasis in the area of experimental research has been shifted to ERTS photography in order to support terrestrial mapping and topical geologic studies. This has necessitated the development of color output capability in order to capitalize on the multispectral nature of the ERTS imagery. Both enhanced false color and simulated true color can be produced at essentially any scale smaller than 1:250,000. It is anticipated that the ERTS developmental work will consume a large fraction of the capability within the project until the Viking 75 missions begin returning data. The Viking Lander also produces multispectral imagery of large format images similar to ERTS. Hence the ERTS development can be thought of as a Viking Lander technique development as well. Finally in 1977 through 1981, the emphasis of the project will shift toward the outer planets and their satellites as the Mariner-Jupiter-Saturn 1977 mission begins to return data.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

2.0002, LONG DURATION EXPOSURE FACILITY EXPERIMENTS FOR EARLY SPACE SHUTTLE MISSIONS
J.A. BAILEY, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1136)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, THE OPTIMAL CONTROL OF LARGE NONLINEAR DYNAMICAL SYSTEMS
B.D. TAPLEY, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: This study is concerned with methods for applying large scale digital computers to the problem of defining optimal control processes for large nonlinear dynamic systems. Both indirect methods such as the perturbation generalized Newton-Raphson and optimal sweep methods, and direct methods such as the gradient or steepest ascent methods are being considered. This study is aimed at defining the convergence times and regions of convergence for the various methods being considered. At the present time, the methods are being applied primarily to the problem of defining the optimal trajectory for the space shuttle-type vehicle on both ascent and reentry trajectories. The stability of the numerical optimization process for this problem is being investigated and extensions of the method to handle state and control variable inequality constraints are being made. Additional studies are concerned with the application of the methods to the study of the optimal climb characteristics of a supersonic transport and to the problem of optimal control of biological and economic systems.

SUPPORTED BY University of Texas

2.0004, AN INVESTIGATION OF THE NEEDS AND THE DESIGN OF AN ORBITING SPACE STATION WITH GROWTH CAPABILITIES
UNKNOWN, Rice University, Graduate School, *Houston, Texas* 77001 (NASW 2776)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, REINFORCED COMPOSITES FOR USE AS SECONDARY STRUCTURAL MATERIALS FOR AIRCRAFT INTERIORS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Chico, California* 95927 (NCA 2-10501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0002, PREPARATION AND IDENTIFICATION OF HYDRIDES OF INTERMETALLIC COMPOUNDS
H. OESTERREICHER, Calif. State Univ. & Colleges, Graduate School, *San Diego, California* 92115 (NSG 3034)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, EVALUATION OF NASA-DEVELOPED MATERIALS FOR FIRE-RESISTANT AIRCRAFT STRUCTURES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75317)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, THERMAL-OXIDATIVE DEGRADATION STUDY ON ELASTOMER FOR USE IN AIRCRAFT TIRES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75410)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, MEASUREMENT OF KINETICS FOR CHEMISORPTION OF H2 AND H2S
UNKNOWN, Univ. of California, Graduate School, *Santa Barbara, California* 93106 (NCA 2-80501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0006, TO INVESTIGATE THE COSMO CHEMISTRY OF INORGANIC ACIDS
UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-85502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0007, ACQUISITION OF SPECIALIZED RESEARCH EQUIPMENT - A MULTICHANNEL HOT-WIRE ANEMOMETER FACILITY
J.W. WESTWATER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

A multichannel hot-wire anemometer facility is provided and will be coupled to an existing IBM 1800 computer. The system will allow recording and data processing of measurements at several points simultaneously in a fluid flow field. Topics of study include the structure of turbulence, unsteady flows, wave phenomena, aerodynamic noise and ignition and extinction mechanisms and other unsteady phenomena associated with combustion studies.

SUPPORTED BY U.S. Natl. Science Foundation

3.0008, EFFECT OF VARIATION IN FUNCTIONALITY DISTRIBUTION
D.M. FRENCH, U.S. Navy, Propellant Science Department, *Silver Spring, Maryland* 20910

To determine the effect of variation in prepolymer functionality distribution on propellant binder properties.

Physical properties will be determined on cured stocks made from prepolymers of different functionality, i.e., different number of reactive groups per molecule.

Supporting agency address information: Naval Surface Wpns. Cen., W.O. Lab. Commander, Silver Spring, Md. 20910

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0009, HIGH TEMPERATURE RESISTANT POLYMERS FOR MISSILES AND OTHER APPLICATIONS
S.E. WENTWORTH, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172

To develop high temperature resistant polymers possessing ease of processing and retention of physical and mechanical properties to be at least 700 degrees F for a range of army applications. Particular applications are as protective coatings for the leading edges of missile fins, structural adhesives near rocket nozzles and as resin matrices for advanced composites useful as lightweight alternatives to metals as structural materials, especially in missile systems.

Polyphenylquinoxalines, which have excellent thermochemical resistance but suffer loss of mechanical properties at elevated temperatures, will be chemically modified to allow for the introduction of crosslinks. Such crosslinks should improve high temperature mechanical properties. An additional problem with the polyphenylquinoxalines is their rather high cost. Since the cost of the tetraketone monomer is the principle reason for the high cost of the polymer, a solution to this problem will be sought thru the development of a low-cost tetraketone synthesis.

Supporting agency address information: AMC Materials and Mechanics Research Ctr., Attn- AMXMR-RA, Watertown, Ms. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0010, ENDOR STUDIES OF RADIATION-PRODUCED TRAPPED ELECTRONS AND RADICALS IN DISORDERED SYSTEMS 12340-C
L. KEVAN, Wayne State University, School of Liberal Arts, *Detroit, Michigan* 48202 (DAHC04-75-G-0050)

To achieve a better understanding of the stabilization mechanisms of reactive ions and radicals in disordered solid media. Relevance: The results have potential payoff to ECOM programs in electron-beam lithographic resists and defects in surface regions of electronic materials. Further, potential for use of the results in the interior ballistics laboratory's radiation chemistry program on propellants and explosives appears promising.

The nature of strong ion-matrix interactions involved in both polar and nonpolar disordered glassy matrices will be investigated by matrix endor techniques. The nature of weak neutral radical-matrix interactions in disordered solids with special emphasis on fluorinated organic matrices will also be studied by the same techniques.

Supporting agency address information: AMC Army Rsch. Office, (ARO- D), Durham, N.C. 28206

SUPPORTED BY U.S. Dept. of Defense - Army

3.0011, STUDY OF BICYCLIC AND CAGE COMPOUNDS
R.D. CLARK, New Mexico Highlands Univ., Graduate School, *Las Vegas, New Mexico* 87701 (NSG 804)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0012, WETTING PHENOMENA IN METALS AND CERAMICS
C.R. MANNING, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (NSG 1133)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0013, CHEMICAL PROCESSES OF SOLID SURFACES
F.E. RUTTENBERG, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - propulsion, flight vehicles. Deficiency - need for improved lubricants, satellite thruster catalysts, fuel cell electrodes. Research - study effects of chemical bonding, ordering and crystallinity at surfaces on catalytic reaction, lubrication, adhesion, and related phenomena. How research contributes - delineates those factors that are important in tailoring surfaces to be used in fuel cells, thruster catalysts, adhesive bonding, and as lubricants.

Apply techniques such as auger electron spectroscopy, low energy electron loss spectroscopy and lead to study of surfaces used in monopropellant rocket catalysts and fuel cells (viz. IR, PT, supported IR) and determine how contaminants and surface ordering affect reaction rates. Particular attention to be given to studies of hydrazine reactions on IR and supported IR surfaces. Later studies to be made on ways lubricant molecules are adsorbed on surfaces and ways that chemical states of surfaces affect this ordering. Develop new methods that can be used to elucidate bonding of surfaces and apply these methods to problems in lubrication, adhesion, and catalysis.

Supporting agency address information: Aerospace Research Laboratory LJ, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0014, FISCHER-TROPSCH AND RELATED PROCESSES - SYNTHESIS OF GASOLINE, DIESEL AND JET FUELS AND METHANOL/METHYL FUEL FROM COAL
F.W. STEFFGEN, U.S. Energy Res. & Dev. Admin., Pittsburgh Energy Res. Center, *Pittsburgh, Pennsylvania* 15213

The objective of this project is to develop improved catalytic processes for preparing clean liquid products from synthesis gas and for upgrading these products to high-quality gasoline, diesel and jet fuels. Catalysts will be prepared and tested in a continuous, high-pressure, catalytic flow reactor in order to develop new improved catalysts for this modified Fischer-Tropsch reaction and for upgrading the synthesis products. The objective of the second part of the project is to develop the most economical catalyst and process for converting coal into a clean, liquid methanol fuel, to be used as a gasoline extender or substitute, utility fuel, and home-heating fuel, and for fuel cells.

SUPPORTED BY U.S. Energy Res. & Development Admin.

3.0015, POLYPHOSPHAZENES AS ULTRAVIOLET RESISTANT POLYMERS
H.R. ALLCOCK, Penn. State University, School of Chemistry, *University Park, Pennsylvania* 16802 (NSG 1141)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0016, DEVELOPMENT OF AN EVAPORATED METAL STRUCTURAL FATIGUE SENSOR
W.R. SCOTT, U.S. Navy, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974

Develop an improved family of resistive fatigue gages having fatigue properties closely matching materials used in aircraft structures.

Ordered alloy systems will be characterized as to fatigue coefficient of resistivity, kinetics of ordering, temperature coefficient of resistivity and strain threshold. The effects of using thin evaporated films instead of foils will also be investigated. factorial design techniques will be used to optimize composition and fabrication parameters for the most promising alloys.

Supporting agency address information: Naval Air Systems Command (320), Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0017, THE ANALYSIS OF PROPELLANT MATERIALS BY FOURIER TRANSFORM NMR 12884-R-C
H. BELL, Virginia Polytechnic Institute, School of Arts, *Blacksburg, Virginia* 24061 (DAHC04-75-G-0043)

To investigate the suitability of high-resolution 1h, 13c, 19f, and 11b Fourier Transform NMR spectroscopy for the qualitative and quantitative analysis of compounds of the type used in propellant formulations. This research could lead to techniques useful in identifying propellant impurities that cause a detrimental effect on the mechanical, physical and chemical properties of solid propellants of army interest.

Using Fourier Transform NMR spectroscopy, it will be determined if the successes in applying NMR to routine structure determination problems can be extended to include the qualitative and quantitative analysis of multicomponent systems containing one or more materials in small amount. Materials to be studied include polymers, plasticizers, aromatic nitro compounds, nitrate esters, ferrocene derivatives, fluoro- compounds, and substituted carboranes.

Supporting agency address information: AMC Army Rsch Office, (ARO- D), Durham, N.C. 28206

SUPPORTED BY U.S. Dept. of Defense - Army

3.0018, SOLID STATE TRACE CONTAMINANT GAS ANALYZER FOR AIRCREW ENVIRONMENTS
R.E. DESSY, Virginia Polytechnic Institute, School of Arts, *Blacksburg, Virginia* 24061 (F41609-75-C-0004)

To design and fabricate a solid state semiconductor hand held gas analyzer applicable to field assessment of trace contaminants in aircrew environments. Present indications are that the semiconductors to be utilized in this gas analyzer are rugged enough not only for field use but also in-flight use. A specific application of an instrument or system of this type is the USAF ATC requirement to test ambient aircraft cockpit atmospheres for the presence of oil vapors and other contaminants.

The approach for the design and fabrication of a prototype instrument of this type will be to modify the semiconductor surface. This will be done by ion-implantation, ion-etching, and/or coating techniques. These techniques, singularly or in combination, will render the device active and specific to given structural families of contaminants, i.e., Co, NOx, hydrocarbons, aromatics and polar compounds. The response of the modified semiconductor will be directed to a micro- processor for analysis and the readout will be accomplished by a strip printer.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0019, MOLECULAR WEIGHT-PROPERTY RELATIONSHIPS OF HIGH PERFORMANCE POLYMERS USED FOR ADHESIVES AND COMPOSITES
D.E. KRANBUEHL, Coll. of William & Mary, School of Arts, *Williamsburg, Virginia* 23185 (NSG 1095)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0020, LOW COST GRAPHITE/THERMOPLASTIC PRIMARY STRUCTURE
M.S. LAAKSO, Boeing Company, *Seattle*, *Washington* 98108 (N62269-74-C-0368)

To demonstrate and evaluate the cost savings attainable through design to low manufacturing cost by application of graphite reinforced thermoplastic composites to a representative aircraft primary structural component. This work is in support of work unit HJ202, 'Development of Composite Structure for Naval Aircraft', agency accession no. DN133038.

The fuselage center section of the BQM-34E supersonic target drone was selected as the primary aircraft structure demonstration component. The redesigned structure will demonstrate the applicabilty of a graphite reinforced thermoplastic material to a primary airframe structure and enable comparison of the cost and weight with those of the metal structure.

Supporting agency address information: Naval Air Development Center, Air Vehicle Technology Dept. (30331), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, THIN FILM BRAGG DEVICES FOR INTEGRATED OPTICAL COMMUNICATION SYSTEMS
S. WANG, Univ. of California, School of Engineering, *Berkeley*, *California* 94720

The Distributed Bragg-Reflector (DBR) laser for use in integrated optical communication system will be the focus of this investigation. Using this approach, the periodic structure is placed outside the active region of the device. The major tasks to be studied include: (1) use of chemical etching for making corrugated waveguides, (2) the energy-gap narrowing effect, (3) the DBR laser performance with an analysis of the mode structure, (4) the analysis of the transient response of DBR lasers, and (5) a feasibility study of DBR ring lasers.

SUPPORTED BY U.S. Natl. Science Foundation

4.0002, INVESTIGATION OF LASER PARTICLE ACCELERATORS
UNKNOWN, Stanford University, Graduate School, *Palo Alto*, *California* 94305 (NSG 7110)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, MAGNETIC LEVITATION AND DYNAMIC STABILITY
C.H. PAPAS, Calif. Inst. of Technology, Graduate School, *Pasadena*, *California* 91109

The dynamic stability of magnetically guided high speed vehicles will be examined with a view toward obtaining results that will be of basic importance for the practical design of such vehicles. Motion of a vehicle containing a current loop and traveling above a conducting strip of finite width exhibits both transverse and vertical instabilities. The possibility of achieving completely stable motion by shaping the conducting guideway and by properly structuring the loop will be examined. Theorems on dynamic stability not unlike Earnshaw's theorem in electrostatics will be sought.

SUPPORTED BY U.S. Natl. Science Foundation

4.0004, CAPACITORS FOR AIRCRAFT HIGH POWER
C.L. DAILEY, T R W Incorporated, *Redondo Beach*, *California* 90278 (F33615-73-C-2068)

To assess the applicability of high energy density capacitors to energy storage systems for USAF airborne high power applications and to develop flight weight capacitor technology for these applications.

This program will be generating the data on dielectrics, impregnants, scavengers and configuration which is necessary to design a capacitor with an energy density of several hundred joules/l beat the required pulse rate, life reliability. Additionally, handling and fabrication techniques and procedures for the promising materials and configurations will be developed. The program concludes with the design of a flight weight capacitor.

Supporting agency address information: AF Aero-Propulsion Laboratory POD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0005, AERODYNAMIC EFFECTS IN THE CONTROL OF POLLUTANT FORMATION IN COMBUSTION
B. MCDONALD, United Aircraft Corporation, *Hartford*, *Connecticut* 06118 (72P21633)

The research program has three primary objectives: 1) To examine experimentally the interaction between the fluid dynamic and chemical processes inside a model combustor as operating conditions are varied and to correlate changes in pollutant emissions with these variations. 2) To further develop an existing elliptic flow computational procedure for predicting the fluid dynamic and chemical processes occurring in combustors. 3) To compare experimental results with results from the combustor flow analysis, to evaluate and calibrate the theoretical model and to assist in interpretation of the experimental results.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

4.0006, WEIGHT MINIMIZATION OF A LARGE AREA EXPANDABLE SPACE STRUCTURE WITH RESPECT TO A MINIMUM ALLOWABLE NATURAL FREQUENCY
T.H. BROOME, Howard University, Graduate School, *Washington*, *District of Columbia* 20001 (NSG 1130)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0007, NEUTRON RADIOGRAPHY
H. BERGER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington*, *District of Columbia* 20234

The program in neutron radiography is part of the NBS effort in Nondestructive Evaluation (NDE). The information obtained complements and supplements that obtained from other NDE techniques. Photographic and real-time neutron image detection methods are used and further developed under this program. Neutron radiographs of cracks in aluminum are under investigation as one method of characterizing crack samples as NDE standards. Radiographs of other samples have been taken for other federal agencies, including some showing corrosion and hydride concentration in metal samples. Preparation of an ASTM Recommended Practice for Thermal Neutron Radiography has started.

The objective of this program is to aid the industrial application of neutron radiography as a nondestructive testing tool by (1) contributing to the improvement of standards in the field, (2) furthering the development of the method, and (3) encouraging use by demonstrating applicability. A further objective is to make use of neutron radiography in NBS and other agency programs.

The use of neutrons for radiography contributes to enhanced NDE capability. As compared to X-radiography, neutron methods offer advantages by virtue of differing attenuation characteristics (light elements such as hydrogen, lithium and boron strongly attenuate thermal neutrons, while most heavy elements are reasonably transparent), sensitivity to isotopic variations, and the capability for inspection of highly radioactive material. These characteristics have led to application of neutron radiography in the nuclear industry (fuel elements, control materials), and the aerospace industry (explosive devices, turbine blades, fuels). The expansion of use of neutron radiography in these industries and others will contribute to better quality assurance.

The neutron radiography work makes use of a thermal neutron beam at the NBS Reactor. A second beam facility at the reactor, giving a higher intensity, and higher energy neutron spectrum, is under design. Photographic and real-time (television) detection methods are being used and further developed. Some work has been done with fast neutrons from the 3MeV Van de Graaff accelerator. Plans for the use of radioactive sources (Cf-252) are being made.

During the past year, the reactor thermal column beam and necessary auxiliary equipment was placed in operation. (Text Abridged.)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

4.0008, A LASER SCANNER FOR 35 MM FILM
W.R. CALLEN, Georgia Inst. of Technology, School of Engineering, *Atlanta, Georgia* 30332 (NAS 8-31193)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0009, DEVELOPMENT OF STRAIN LEVEL COUNTING SYSTEM
R. ONLEY, General Time Corporation, *Arlington Heights, Illinois* 60008 (N62269-74-C-0546)

Provide advanced strain level counters to improve the Navy's Fatigue Monitoring Program. This contract supports work unit DJ704, 'Development of Advanced Metal Structure for Naval Aircraft,' agency accession no. DN033220.

Develop 7-level Strain Exceedance Counting System with visual digital presentation.

Supporting agency address information: Naval Air Development Center, Air Vehicle Technology Dept. (30332), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0010, NAVY VEHICLE DESIGN AND CONSTRUCTION - THE EFFECTS OF A TRAVELING SOUND WAVE ON A PLANE TURBULENT JET
V.W. GOLDSCHMIDT, Purdue University, School of Mechanical Engin., *Lafayette, Indiana* 47907 (N00014-67-A-0226-0025)

Control, propulsion and acoustic aspects of naval vehicles, which are of continuing interest to the Navy, are all dependent on the characteristics of turbulent boundary layer flows. The results of this research on the interaction of sound and turbulence should lead to improved understanding and more accurate predictions of turbulent flows and consequently to improved designs of vehicle systems and components such as propulsor and control device configurations.

Experimental and analytical study of turbulent flow fields will be carried out with emphasis on the interaction of acoustics and turbulence in the specific case of a plane turbulent jet and a traveling acoustic wave. The proposed effort will include: (1) set-up of experimental facilities; (2) study of the widening rate of the jet in the presence of the acoustic field; (3) determining the changes in the local characteristics of the jet due to the acoustic interacting signal; and (4) analytical investigation leading to better understanding of the spectral disturbances in the turbulent flow fields and the coupling effects of acoustics and turbulence.

Supporting agency address information: Office of Naval Research 438, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0011, RELIABILITY DEMONSTRATION TESTS OF THE IMPROVED ATCRBS ANTENNA
UNKNOWN, Westinghouse Electric Corp., *Baltimore, Maryland* 21227 (055798 (TRAIS NO.))

Conduct a reliability demonstration of the independent rotator improved ATCRBS antenna fabricated by the Contractor under Contract No. DOT-TSC-600. The improved ATCRBS directional and omni-directional antennas mounted on the pedestal shall be operated at the Contractor's facility fully exposed to the outside ambient environment for the test period. The continual application of R.F. to the antenna is not required.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0012, SERVICE EVALUATION OF BQM-34E GRAPHITE/EPOXY WINGS
D. RUCK, Fairchild Space & Elect. Co., *Hagerstown, Maryland* 21740 (N62269-74-C-0366)

To demonstrate the service durability and structural reliability of advanced fiber-reinforced composite aircraft structures under Navy operational usage. To determine the reproducibility of such structures when produced by a pilot-production program and to provide realistic production cost data which can be used as a basis for future economic projections. This work is in support of work unit HJ202, 'Development of Composite Structure for Naval Aircraft,' agency accession no. DN133038.

Five composite wings for the BQM-34E unmanned aerial target will be fabricated according to a NavAirDevCen design, using manufacturing methods that will be suitable for full scale production. Production costs will be closely monitored. The components will be installed on existing BQM-34E drones and subjected to normal service usage. The condition of these wings will be monitored periodically over the life of the drone. (Note: The service evaluation of the composite wings is not included in the contract.)

Supporting agency address information: Naval Air Development Center, Air Vehicle Technology Dept. (30332), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0013, SOUNDING ROCKET SYSTEMS
E.F. MCKENNA, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - rocket techniques devices. Deficiency or opportunity - new rocket payloads and improved payload recovery systems are required in order to conduct reliable rocket operations. Objective - development of new techniques and devices in the areas of propulsion, air frames, signal conditioning and structures to enhance capabilities of sounding rocket payload operations. How research contributes - sensing platforms for conduct of experiments measuring aerospace variables of importance to AF systems and the expertise required to support aerospace probing under a number of projects are provided.

Existing probe vehicle designs will be modified and new devices will be developed to meet the varying requirements of AFCRL scientists supported. A reentry parameter study to develop drag coefficients for various trim angles of attack of reentry bodies will be completed. The analytical efforts confirmed by wind tunnel tests will be reduced to engineering utility for the proper design of recovery systems. A small, light-weight, low-cost, long-duration, multifunction programmer utilizing newly available integrated circuits will be developed.

Supporting agency address information: AF Cambridge Research Laboratories IC, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0014, THREE-DIMENSIONAL HIGHLY LOADED TRANSONIC COMPRESSOR FLOW
J.E. MCCUNE, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (AF-AFOSR-2784-75)

Current aerodynamic analyses of axial flow compressors are limited to small perturbations. This research project has as its objective developing a technique to predict the flow conditions for highly loaded (high angle of attack) annular and rectilinear cascades in transonic flow. The basic idea is to develop a theory which allows the vorticity to be convected by the mean flow field. The effort examines the case of a flow through a rotor which is doing 'almost' constant work. If successful, this technique would relax the small perturbation assumption which is currently the state-of-the-art and would be useful in the solution of a wide range of important problems in the three-dimensional theory of axial flow compressors.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd. Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0015, TIME-OF-FLIGHT SPECTROSCOPY
J.C. ZORN, Univ. of Michigan, School of Arts, *Ann Arbor, Michigan* 48104

This project is the continuation of an already established joint research program between the Atomic Physics Groups of the University of Michigan (U.S.A.) and the Instituto Nacional de Energia Nuclear of Mexico.

One main objective of this research is the detection of molecular alignment in hypersonic gas flow by means of Time-of-flight Spectroscopy (TOFS) on metastable atoms dissociated by electron impact. Another objective is the comparative study of the two current methods of detecting the products dissociative excitation of molecular hydrogen, i.e. the direct detection of metastable products and their detection through electric-field quenching and subsequent detection of the ensuing Ly-a photon.

SUPPORTED BY U.S. Natl. Science Foundation

4.0016, NUCLEAR SPACE POWER AND PROPULSION SYSTEMS ANALYSIS
J.P. LAYTON, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (AT(11-1)-2393)

Develop methodology for the analysis of performance, reliability, and economies of standardized nuclear and non-nuclear powered spacecraft on various geocentric missions.

Concept and analyse novel and advanced reactors for space and other special power systems.

Results: Comparative economic analysis have been performed for selected standardized nuclear powered spacecraft for different mission models. The use of standardized nuclear, rather than current mission- specialized spacecraft appears to offer substantial savings: e.g., approximately 450 M$ for 10 selected missions from the 1972 NASA Mission Model during the 1980's. 2. A comprehensive study of space power systems for 1980's military applications was participated in by the Research Leader that identified performance, applications, safety, costs, availability and the advantages/disadvantages of the various systems. 3. Preliminary assessments and analyses have been made of advanced nuclear systems including radioisotope generators, dual mode power/propulsion systems, surface effect ships, and nuclear aircraft.

SUPPORTED BY U.S. Atomic Energy Commission

4.0017, DIGITAL/MODULAR AVIONICS COMMUNICATIONS SUPPORT
G.G. CHANDLER, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703

The objective of this program is to provide communications system support to the main digital modular avionics program which will design and breadboard a core Army avionics system using digital/modular techniques. The element of the core system will consist of communication, navigation, IFF transponder, and general purpose day/night display components. Under this program specialized support will be provided for the communications equipment elements in the form of electrical and digital interfacing.

Current aircraft communications equipment will be surveyed for suitability of use in the core avionics system. An optimal communications equipment configuration will be selected, using when possible, standard military units. A detailed communications interface analysis will be performed to determine the interface parameters between the communications equipments and the core system. Following determination of basic core systems interface standards, the required communications interface circuitry will be designed.

Supporting agency address information: ECOM Avionics Laboratory, AMSEL-VL-C), US Army Electronics Command, Ft Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0018, DIGITAL/MODULAR AVIONICS (COMMUNICATIONS)
G.G. CHANDLER, U.S. Army, Avionics Laboratory, *Red Bank, New Jersey* 07703

The objective of this program is to provide communications system support to the main digital modular avionics program which will design and breadboard a core Army avionics system using digital modular techniques. The elements of this core system will consist of communications, navigation, IFF transponder, and general purpose day/night display components. Specialized support will be provided for the communications equipment elements in the form of electrical and digital interfacing.

The approach will consist of selecting suitable communications equipment for the core system, establishing the interface standards and design criteria between the core system and communications subsystem and providing support for bench and flight tests of the entire core avionics system.

Supporting agency address information: ECOM Avionics Lab. US Army Electronics Command, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0019, SOUND TRANSMISSION THROUGH SUPERSONIC JETS
I. GREBER, Case Western Reserve Univ., School of Engineering, *Cleveland, Ohio* 44106 (AF-AFOSR-2750-75)

The air force is presently, and will probably continue to be in the foreseeable future, a large user of high speed subsonic jet aircraft. the principal means of propulsion of such aircraft is the turbojet. An undesirable by-product of these engines is the generation of noise which causes such adverse effects as degradation in human performance, reduced reliability of structural and equipment subsystems, and increased maintenance costs. Unlike civilian aircraft the exhaust from Air Force turbojets can be supersonic. The design of engine parts and vehicle subsystems and soundproofing material to alleviate noise effects requires accurate definition of the intensity, occurrence and propagation of this noise. In order to partially fulfill this requirement an experimental study of the problem of supersonic jet noise is being made. The main emphasis in this study will be on the transmission of sound from within a supersonic jet to the surroundings. The primary quantity to be measured will be the spatial distribution of sound pressure, as a function of frequency, in the field outside the jet due to a simple sound source within the jet. Although the major effort of this program will be experimental, consideration will be given to a theoretical description of the phenomena.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, FUNDAMENTAL PROCESSES OF SUPERSONIC MIXING AND COMBUSTION
M.E. NEER, Technology Incorporated, *Dayton, Ohio* 45431 (F33615-75-C-1010)

AF function - advanced aerospace propulsion. Deficiency - lack of fundamental data on fluid dynamic, chemical and thermodynamic processes occurring in supersonic burning ramjet and other reacting flows. Research - fundamental studies of fluid dynamic, chemical kinetic, and nonequilibrium phenomena occurring in high-speed heterogeneous gas flows. How research contributes - provides improved gas streams in confined ducts. Research results are applicable to specific fluid dynamic problem areas in airbreathing hypersonic propulsion concepts and also high-energy gas lasers.

Fundamental investigations will be conducted in the area of supersonic mixing and combustion, specifically related to the in-house research program and the ARL supersonic combustion research facility. these investigations will include literature survey and analysis, theoretical and numerical studies of turbulent mixing and supersonic combustion in confined hydrogen-air streams, analysis and extension of current experimental capabilities, integration of diagnostic techniques and instrumentation, experimental program planning, and participation in conduct of experiments as appropriate.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0021, SURFACE AND ELECTRICAL PROPERTIES OF III-V COMPOUNDS
D.W. LANGER, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - communications and avionics by microwave generation, processing and detection. Deficiency - frequency limitations and power limitations at high frequencies exist. These requirements are often coupled with needs for miniturization, radiation resistance and sometimes higher operating temperatures. Deployment of reliable gallium arsenide, GAAS, semiconductor devices would result in a substantial improvement over presently used devices and assure future Air Force superiority. Research - analytical research is needed to determine causes of limitations on state-of-the-art GAAS devices in order that these devices reach their full potential. Apart from problems introduced by present fabrication techniques there are limitations inherent to the preparation of the basic device material, its active regions, and the interfaces of the material with the active region, metal contacts, and its environment. Elemental and stoichiometric analysis at the interfaces and surfaces is performed in order to determine the electronic effects introduced by imperfections in these regions. How research contributes - a knowledge of undesirable effects of those imperfections known to be present as well as other undesirable effects identified in the study will influence future fabrication processes by allowing prime emphasis to be given to the elimination of these undesirable impurities and imperfections. Simultaneously those processing and passivating techniques which produce a minimum adverse effect on the device characteristics will be identified.

Thermally stimulated current, luminescence spectroscopy and high speed c-v measurements are performed on junctions in order to identify the electronic energy levels and the kinetics of native and foreign impurities in the neighborhood of this region. Electron emission spectroscopy is employed to study electronic surface states of GAAS surfaces which have been heat treated and subjected to a variety of surface treatments. Elemental analysis is made by X-ray induced electron emission spectroscopy and auger-electron spectroscopy.

Supporting agency address information: Aerospace Research Laboratory LS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0022, ELECTROCHEMICAL ENERGY PROCESSES
L. SPIALTER, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - flight operations. Deficiency - batteries and fuel cells, as electrical energy sources, have insufficient power density, capacity, and service life. Research - study basic electrochemical phenomena and newer component concepts. How research contributes - obtains mechanistic and properties data applicable to design and fabrication of improved batteries and fuel cells, and power transmission capability.

Investigate performance mechanisms and characteristics of newer concepts and types of electrolyte solvents, solutes, and electrodes with ion-active and electron- active properties. Study mutual compatibilities of these elements as components of electrochemical reactors and, where appropriate, demonstrate utility in suitable prototype models.

Supporting agency address information: Aerospace Research Laboratory LJ, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0023, ILS SCALE MODELING FACILITY
A.H. LAGRONE, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: An ILS scale model facility has been built and tested. Tests showed that under ideal conditions the facility was operating within design tolerances. In the field, conditions are seldom ideal, consequently, certain features had to be redesigned and rebuilt.

This project is primarily one of designing and building a transmitter with a stability of one part in 10 million. A very stable local oscillator is also being designed for the receiver.

SUPPORTED BY University of Texas

4.0024, DETERMINING A MATHEMATICAL MODEL FOR RADIO PROPAGATION STUDIES OVER IRREGULAR TERRAIN
A.H. LAGRONE, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: Problems involved in remotely guiding vehicles by radio signals in irregular terrain environments are very complicated and many times must be solved by full scale measurements. These are very expensive, time consuming, and interfere with normal airport operations. Theoretical analyses have not been too successful, and consequently are not reliably regarded. This study involves mathematically modeling difficult sites and simultaneously comparing mathematical solutions of the problem with onsite measurements by appropriate radio facilities. Discrepancies in the two solutions will be noted and adjustments made in the mathematical model until a satisfactory agreement is reached.

SUPPORTED BY University of Texas

4.0025, CHARACTERIZATION OF HYDROCARBON EMISSIONS FROM AIR FORCE TURBINE ENGINES
J.P. CONKLE, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235

The effort will provide baseline data for assessing the biomedical impact of air force aircraft operations, prior to the advent of regulatory restrictions. The information is required not only for assessing environmental impact but also for evaluating combustor design criteria, smoke suppression additives and engine operational cycles. The work is closely coupled and coordinated with ongoing turbine engine emissions measurement at the afwl and afapl.

Chemical characterization of the organic compounds present in turbine engine exhaust will be accomplished for both gaseous and particulate specie. Samples will be obtained from a variety of sources including AF and Navy operational engine test stands and the AFAPL single combustor test rig. Analysis will be performed by a coupled gas chromatograph-mass spectrometer- data system. Results will be screened by AMRL/TH for toxic hazard assessment.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0026, UNSTEADY TURBULENT BOUNDARY LAYERS AND SEPARATION
D.P. TELIONIS, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (AF-AFOSR-2651-74)

Several important AF gas turbine engineering developments have suffered major time and cost penalties due to vibration/flutter problems. A method does not exist for reliably predicting the aerodynamic stability of compressor and turbine blades. This research effort involves development of a technique to aid in the prediction of rotating stall boundaries for the fan/compressors/turbines of high performance aircraft gas turbine engines. An attempt will be made to establish an unsteady turbulent boundary layer separation point criterion.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0027, HIGH-SPEED ROTOR BALANCING 12515-E
W.D. PILKEY, Univ. of Virginia, School of Engineering, *Charlottesville, Virginia* 22903 (DAHC04-75-G-0055)

To develop (1) mathematical programming techniques to optimize the balancing of rotors, and (2) optimize design of suspension systems for rotating shafts. Relevance: the army is using heavy equipment, large shafts, and high speed rotating systems. These require new and sensitive methods of balancing as well as improved methods of suspension. This proposal is addressed to just such needs.

The approach is mathematical using programming techniques as well as statistical methods to investigate noise in the system and its relation to system sensitivity.

Supporting agency address information: AMC Army Rsch Office, (AROi D), Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0028, DESIGN AND FABRICATION OF A HIGH RESOLUTION CRT/INTERFACE SYSTEM
A.K. TREHAN, Hampton Institute, Graduate School, *Hampton, Virginia* 23368 (NSG 1146)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0029, HT AM 74-3- EVALUATION OF CONTROLLABLE TWIST ROTOR (CTR) AEROELASTIC CHARACTERISTICS
W.E. NETTLES, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604

To develop a first hand working knowledge of CTR analysis procedures including the 6-f program, and to perform sufficient in-house study of CTR design parameters to produce the ability to effectively monitor the contractor's effort under contract DAAJ02-72-C-0092. whirl tower and wind tunnel test of the ctr rotor system. Emphasis will be placed on evaluating those areas in which the contractor is experiencing difficulty and providing guidance to overcome these specific problem areas.

The capability will be developed to use the Kaman 6-f aeroelastic analysis computer program on the Eustis direcorate's computer. This will involve the developement of necessary documentation to define progrm input and output. When this capability has been established, computer analysis of selected flight conditions, control settings, and configuration parameters will be made to provide a thorough understanding of the system aeroelastic characteristics, to check the accuracy of Kaman procedures, and to generally gain insight into the problem.

Supporting agency address information: Eustis Directorate, US Army Mobility R and D Lab, Ft Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, EARTH RESOURCES DATA ACQUISITION SENSOR STUDY
E.W. GROHSE, Univ. of Alabama, School of Science, *Huntsville, Alabama* 35814 (NAS 8-31169)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0002, EARTH AND OCEAN MODELING
F.M. KNEZOVICH, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-31194)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0003, THE OPTICAL SPECTRUM OF PROTON-EXCITED AURORAS
V. DEGEN, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

During this second year of the grant emphasis will be placed on acquisition and analysis of data. Techniques which have been developed for preparation of synthetic spectra will be applied to aid in the interpretation of data. The work will be directed primarily to the interpretation of proton auroras and the understanding of the basic physical phenomena involved in their generation.

SUPPORTED BY U.S. Natl. Science Foundation

5.0004, MAGNETOSPHERIC SUBSTORMS
K.A. ANDERSON, Univ. of California, Graduate School, *Berkeley, California* 94720

Correlative studies of interactions between the interplanetary magnetic field and the geomagnetic field will be made with this grant. Magnetic field, plasma, and particle data from several satellites will be combined with ground level observations. Emphasis is placed on the identification of effects of magnetospheric responses to interplanetary magnetic field changes and their distinction from effects of magnetospheric substorms. Particular attention will be given to the role of the interplanetary magnetic field in the variations of the size and location of the instantaneous auroral oval, magnetotail reconfiguration, and transient variations of the dayside magnetopause. The proposed projects shall be studied as much as possible on the basis of presently available data.

SUPPORTED BY U.S. Natl. Science Foundation

5.0005, FORESTRY APPLICATIONS RESEARCH ON TIMBER RESOURCES
D.T. LAUER, Univ. of California, Space Sciences Laboratory, *Berkeley, California* 94704 (NAS 9-14452)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0006, OPTIMIZED EXPERIMENT FOR MEASURING PREZOMAGNETIC SIGNALS OF ECOLOGICAL ORIGIN
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NCA 2-50504)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0007, AS PALEOENVIRONMENTAL INDICATOR
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Hayward, California* 94541 (NCA 2-90501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0008, HARDENING BMD MATERIALS
W. WOOLSON, Science Applications Inc., *La Jolla, California* 92037 (DAAD05-74-C-0787)

Modify the Morse Monte Carlo code with appropriate high altitude geometry routines to perform space, energy, and time dependent neutron and photon transport.

The Morse Monte Carlo code will be modified with geometry routines that specifically treat the non-uniformity of the atmosphere at high altitutes and effects of earth curvature in an analytical manner. geometry routines available in the Hart code will also be interfaced to provide an efficient high altitude version of the Morse code.

Supporting agency address information: AMC Ballistic Research Lab, Aberdeen, PG Md 21005

SUPPORTED BY U.S. Dept. of Defense - Army

5.0009, PLASMA SHEET VARIATIONS AND SUBSTORM DEVELOPMENT ON THE GROUND
R.L. MCPHERRON, Univ. of California, School of Letters, *Los Angeles, California* 90024

This grant will be used to investigate the relation of the longitudinal and latitudinal development of substorms observed from the ground to phenomena occurring in the plasma sheet by use of correlated multiple satellite and ground data. Simultaneous magnetic field and energetic (approximately greater than 40 kev) particle fluxes measured by two satellites at closely spaced (approximately greater than 10 Re) locations in the magnetospheric tail will make it possible to distinguish temporal from spatial variations in the plasma sheet. The inferred plasma-sheet variations will then be correlated with ground variations to obtain a more comprehensive interpretation of substorm processes.

SUPPORTED BY U.S. Natl. Science Foundation

5.0010, THE DYNAMICS OF CONCENTRATED VORTICES
T. MAXWORTHY, Univ. of Southern California, School of Engineering, *Los Angeles, California* 90007

This action shall provide one additional year of support for experimental work on the dynamics of concentrated vortices under GK- 38147X. The three main areas of study are: 1) Laboratory studies of buoyant vortex bubbles thermals in unstratified, stratified and turbulent atmospheres. 2) The dynamics of large concentrated vortices - simulation and scaling laws. 3) Dust devil dynamics - large scale experiments and possible field tests.

SUPPORTED BY U.S. Natl. Science Foundation

5.0011, FIELD MEASUREMENTS FOR HEAT CAPACITY MAPPING
R.J. LYON, Stanford University, School of Earth Sciences, *Palo Alto, California* 94305 (NSG 5050)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0012, REMOTE SENSING OF OCEAN PROPERTIES VIA VISIBLE LIGHT
S.Q. DUNTLEY, Univ. of California, Graduate School, *San Diego, California* 92038 (04-3-158-64)

Objectives: To obtain a complete set of surface truth data at sea that is germane to visible region remote sensing and to use these data to calculate the available spectral radiance signatures at orbital and aircraft altitudes. To develop refined and tested data acquisition and analysis techniques for such surface truth information and to acquire useful knowledge of the dependence of apparent spectral radiance signatures on the biological and meteorological environment.

Approach: Special research equipment (spectroradiometer, transmissometer, contrast reduction meter, data logger, etc.) for rapid measurement of optical properties of the water and atmosphere are on hand at SIO. A 4-day experiment at sea will be carried out in the first quarter (Jan-Mar) of 1975 in the ocean area off Southern California. Calibration and utilization of the above instruments will be used for surface truth data operations. Upwelling spectral radiance below the ocean surface, the vertical profile of optical water properties, and the atmospheric-optical conditions will be measured. The techniques developed for data acquisition and analysis will provide useful knowledge for surface truth information and the dependence of apparent spectral radiance signatures on the biological and meteorological environment.

Progress: The contractor has developed the capability to produce, using computer techniques, the spatial distribution of the apparent radiance of the ocean surface when the water constituents, the distribution of sky radiance above the water, surface wind speed, and optical properties of the atmosphere are known. The fabrication of instruments for measuring the optical environment and software programs for processing and displaying optical data has been accomplished by the contractor. Documentation of a study of the detection of ocean chlorophyll from earth orbit, a study of the inherent spectral radiance signatures of the ocean surface, and a study of the reflectance characteristics of whitecaps, foam, and spray has been completed by the contractor.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0013, INFRARED RADIOMETRY AND SEA/AIR INTERACTION STUDIES
T.D. FOSTER, Univ. of California, Graduate School, *San Diego, California* 92038 (04-3-158-55)

The two-wave length infrared radiometer built by SIO was designed to make direct measurements of sea surface temperature and total heat flux through the sea surface. This grant was directed toward improving and evaluating this radiometer.

Field tests of the radiometer together with acquisition of air temperature, dew point, bulk water temperature, wind speed and direction, and net radiative heat flux were made in April and June 1973 off San Clemente island. Tests were also made in a wind/water tunnel. Modifications to the instrument were made to increase its accuracy but results were not as good as expected.

Considerable support has been provided in the development and evaluation of this instrument by the SPOC Project. It appears that accurate measurements of SST and heat flux can be made with an overhaul of the optical system. Since this sensor cannot be used from space altitudes, it is recommended that further NOAA support be dropped.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0014, GEOS-C RESEARCH
UNKNOWN, Univ. of California, Graduate School, *San Diego, California* 92038 (NAS 6-2506)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0015, SPECTRAL TRANSFER IN HIGH REYNOLDS NUMBER TURBULENT FLOWS
C.W. VANATTA, Univ. of California, Graduate School, *San Diego, California* 92038

A group of atmospheric turbulence problems will be investigated both in the laboratory as well as in situ. Attention will be given to spectral energy transfer, intermittent structure of atmospheric flows and its effects on dissipation rate and rate of energy transfer and the nonlinear characteristics of probes so that differences in measurements can be resolved.

SUPPORTED BY U.S. Natl. Science Foundation

5.0016, THE CHEMICAL APPROACH TO STORAGE OF SOLAR ENERGY
G.S. HAMMOND, Univ. of California, Graduate School, *Santa Cruz, California* 95060

The research being supported under this award is the study of photochemical reactions caused by light of visible wavelengths. The object is to find reactions suitable for chemical storage of solar energy. The investigators are following several paths including: (1) discovering energy-storing valence isomerization reactions caused by excitation from visible light either by bimolecular sensitization or by special mechanisms for nonradiative decay in bichromophoric molecules, (2) elucidate potential electron transfer reactions in which excited states of molecules (either organic or inorganic) act as either electron donors or acceptors, and (3) the characterization of new photogalvanic systems. The photogalvanic studies involve two approaches: (1) work with electrode design and arrangement using systems which are already known to produce significant photopotentials on irradiation and (2) search for new redox couples which can be subjected to photochemical pumping in an effort to find systems that will not undergo rapid thermal deterioration under working conditions.

SUPPORTED BY U.S. Natl. Science Foundation

5.0017, AERONOMICAL AND METEOROLOGICAL RESEARCH AT THE JICAMARCA RADIO OBSERVATORY OF THE GEOPHYSICAL INSTITUTE OF PERU
W.N. HESS, U.S. Dept. of Commerce, Natl. Oceanic & Atmos. Admin., *Boulder, Colorado* 80302

The Jicamarca Facility will continue to perform research into the physics of the equatorial ionosphere. In addition, facilities will be made available to many U.S. scientists funded by both the National Science Foundation and other Government agencies.

SUPPORTED BY U.S. Natl. Science Foundation

5.0018, ULF/ULF WAVE PROPAGATION
J. WAIT, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: The objective is to provide applicable analyses for the interaction of electromagnetic waves with the earth's crustal layer. The final results will assist in the interpretation of field data in terms of the structure of the earth's crust and the nature of the causative currents in the ionosphere. Consulting to the sponsor is also considered an integral part of the project.

Current year plan: The analysis is to be completed concurrently with consulting with the sponsor on a summer field program in Wisconsin. Computational results will be assembled shortly prior to their use in the interpretational scheme.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0019, HYDROMAGNETIC DYNAMO MODELS FOR THE MAIN GEOMAGNETIC FIELD
E.R. BENTON, Univ. of Colorado, School of Arts, *Boulder, Colorado* 80304

This project will first elucidate and then extend the class of helical Lortz dynamos so that it can be used as a basis for developing self-consistent hydromagnetic models of earth's steady axial dipole and lowest harmonics of the non-dipole magnetic field. Principal geophysical constraints utilized in defining and assessing the models include the spherical annular geometry of the outer core, the weak regionally uniform geothermal flux seen at earth's surface, and the strong electromagnetic core-mantle coupling implied by studies of earth rotation. Emphasis is placed on exact yet tractable analysis and upon acquiring an understanding of the driving mechanism and energetics of the geodynamo.

SUPPORTED BY U.S. Natl. Science Foundation

5.0020, BASIC INVESTIGATION OF REMOTELY DETECTABLE DEPOSITS OF OIL AND GAS (BIRDDOG)
T.J. DONOVAN, U.S. Dept. of the Interior, Geological Survey, *Denver, Colorado* 80225

States to which project pertains: Wyoming, Oklahoma, Colorado.

The basic objective is to develop a rationale for an integrated remote sensing-geochemical petroleum exploration system. The concept arises from state-of-the-art capabilities already developed within the USGS. Previous study has isolated the mineralogic and chemical effects of at least two distinct processes related to microseepage. The diagenetically produced mineralogic and chemical anomalies and related geomorphic effects in outcropping surface rocks signal the presence of buried petroleum and (or) natural gas. These alterations should be amenable for detection using remote imagery and other high altitude and space-acquired data. Unusual isotopic compositions of the surface mineralizations provides ground truth. The ultimate goal is to develop a low cost integrated exploration technique for on-shore exploration, particularly by independent geologists.

A four-step method is planned: (1) Reconnaissance of key petroleum provinces with computer-enhanced ERTS MSS imagery to isolate and enhance the slight 'erasures' and 'hazy areas' shown to occur over known petroleum deposits. (2) Underflight verification using structural and geomorphic analyses, confirmation and mapping of alteration zones, low- level false-color photography, etc., using light aircraft. (3) Field work for ground truth and detailed mapping based on priorities assigned in Step (2). (4) Geophysical follow-up for third-dimension data in areas positively identified in steps (1), (2), and (3). Implementation of avant-garde tools and techniques such as helium detection.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0021, BASIC FIELD STUDIES OF CLOUD NUCLEATION IN DUST STORMS AND CONTINENTAL AIR MASSES
V.K. SAXENA, Univ. of Denver, Denver Research Institute, *Denver, Colorado* 80210

The cloud nucleation process that involves only those cloud condensation nuclei (CCN) which have their critical supersaturations smaller than the real, maximum cloud supersaturation is proposed to be studied in the folded tropopause layer during dust storms in the Great Plains. This research will measure the activity spectrum of the CCN at two altitudes across the folded tropopause layer. The higher altitude measurements will yield the CCN spectrum in the unmodified stratospheric aerosol which gets transported into the mid-troposphere as a result of tropopause folding during the large-scale cyclogenesis and also gets advected to the line of convective storms where its nucleating ability affects the storm system. The lower altitude measurements will provide information regarding the change in the nucleating ability of the stratospheric aerosol resulting from the tropospheric mixing. A newly developed CCN spectrometer will be used for taking these measurments.

SUPPORTED BY U.S. Natl. Science Foundation

5.0022, ELEMENTARY IONIZATION PROCESSES IN ATMOSPHERIC MOLECULES
R.L. STOCKBAUER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

This project is concerned with the development and application of photoionization mass spectrometry techniques to the accurate measurement and interpretation of ionization and photoion fragmentation thresholds, fragment ion kinetic energy distributions and fragmentation mechanisms of atmospheric molecules.

Objective: For the coming year the objectives are to determine the ionization potentials of OH and OD radicals and to estimate as accurately as possible the vibrational frequencies and harmonicities of the OH ion and OD ion; to study the fragmentation mechanisms of N2O; and to complete construction and testing of a new photoion-photoelectron coincidence mass spectrometer.

Motivation: Information of the type described above is needed for the modeling of the behavior of the earth's atmosphere and other planetary atmospheres and to interpret observations obtained elsewhere by atmospheric and space probes.

Approach: Is to select for measurement those molecules and species of current interest, i.e. the significant atmospheric molecules.

Progress: Dissociative ionization of H2O, D2O, NH3, NH2D, NHD2, and ND3 have been studied, and threshold energies for formation of OH ion, OD ion, NH2 ion, NHD ion, and ND2 ion near threshold. It is inferred that essentially the entire rotational energy of H2O and NH3 is available for dissociative ionization.

Work on the design and construction of a Photoelectron-Photoion Coincidence Mass Spectrometer is in progress. The instrument will include the capability for measuring initial kinetic energy distribution of fragment ions. Design studies have been carried out, and acquisition of electronics and construction of hardware are under way.

Plans: To write up a full paper on the results of the study on H2O and NH3 and their corresponding deuterated species by Oct. 1.

To study the fragmentation behavior of normal and isotopically labeled N2O to assess the relative importance of simple bond dissociative vs. rearrangement via bent configurations in the formation of the NO ion fragment ion by Feb. 1.

To complete construction and testing of the photoion-photoelectron coincidence mass spectrometer by June 1.

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

5.0023, MODELS TO PREDICT EARTH-AIR INTERFACE TEMPERATURE REGIMES DURING FREEZE CONDITIONS
J.F. BARTHOLIC, Univ. of Florida, School of Agriculture, *Gainesville, Florida* 32601 (NAS10-8774)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0024, NATIONAL WIND ENERGY STATISTICS FOR LARGE ARRAYS OF AEROGENERATORS
C.G. JUSTUS, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332

This project is one of a series of research efforts to improve the capability for identifying and selecting sites for wind energy systems and verifying the expected energy distribution from potential wind energy system sites.

The objective of this project is to determine the significant spatial and temporal wind energy statistics to guide the spacing and locating of aerogenerator systems. In particular, the effects of spatial avaraging of power output as a function of aerogenerator spacing within an array as well as over large distances between arrays will be examined. Parameters to be examined include autocorrelation and cross correlations of wind speed and power in

several different regions and areas, return times (i.e., average times for levels to return to a given level after deviating) and probability distributions of wind speed and power for arrays as compared to individual units. The statistical variation of wind with height will also be examined.

SUPPORTED BY U.S. Natl. Science Foundation

5.0025, IONOSPHERIC DYNAMICS BY THOMSON SCATTER
S.A. BOWHILL, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

This grant is for a 1-year extension of studies of ionospheric dynamics by the incoherent-scatter technique. It includes the continuation of work on mesopheric dynamics at Jicamarca (though in this case the scattering mechanism is not in fact conventional incoherent- scatter), and studies of sporadic E over Arecibo. It includes new work on protonospheric thermal structure.

SUPPORTED BY U.S. Natl. Science Foundation

5.0026, PRODUCTION AND LOSS PROCESSES FOR ATMOSPHERIC IONIZATION
S.A. BOWHILL, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

This grant is a continuation of National Science Foundation grant GA-36911X. It supports theoretical investigation of four main ionospheric topics: 1. D-region chemistry and dynamics including effects of: solar flares, solar cycle, sunrise and sunset, solar eclipse, latitude, season, energetic particles and transport. 2. E- Degion chemistry and dynamics with emphasis on the role of super-elastic collisions. 3. F-region chemistry, particularly resolution problems arising from the apparent incompatibility of reaction rates and solar E UV fluxes. 4. The thermal structure of the E and F regions with especial interest centering on the role of photoelectrons.

SUPPORTED BY U.S. Natl. Science Foundation

5.0027, MARSH VEGETATION STUDY
L.B. THEIN, Tulane University of Louisiana, Graduate School, *New Orleans, Louisiana* 70118 (NAS 9-14501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0028, IN RESOURCE AND ENVIRONMENTAL MANAGEMENT OF THE CHESAPEAKE BAY REGION
D.M. HARMON, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (NSG 6001)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0029, STUDY OF THE GEOCHEMISTRY AND DISPERSAL OF RADIONUCLIDES AND TRACE METALS IN CHESAPEAKE BAY SEDIMENTS
S.E. SOMMER, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (NSG 5047)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0030, SPECTROSCOPY OF STRATOSPHERIC MOLECULES AND NEUTRAL CLUSTERS
D.E. FREEMAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - environmental impact of high altitude AF vehicles (B- 1, F-15). Deficiency - poorly characterized energetics of stratospheric constituents and unknown energetics of pollutant formation. Objective - ultraviolet spectroscopic determination of energy levels and structures of stratospheric molecules and pollutants. How research contributes - laboratory based vacuum spectrographs operated at high resolution provide accurate data on the interaction of ultraviolet radiation with stratospheric molecules and pollutants. Processes leading to photoionization and photodissociation of stratospheric constituents such as ozone, carbon dioxide, nitrogen oxides and sulfur oxides are identified and the excited molecular states are difinitively characterized. The radiative properties of neutral molecular clusters such as arise from engine emissions are studied.

Major equipment requirements are satisfied by presently existing vacuum spectrographs ranging in size from 2 to 6.65 meters and operating in the wavelength region from 60 to 350 manometers. The 6.65 meter instrument will be fitted with a new diffraction grating designed to provide the ultrahigh resolution needed to elucidate the complex band structures of stratospheric molecules. Facilities for the semi-automatic reduction of spectrograms to wavelength and frequencies already exist. the complexity of the theoretical analysis of band systems of triatomic stratospheric molecules varies vastly with species and wavelength region. Successful analysis yields rotational, vibrational and electronic excitation energies, dissociation energies and ionization potentials. Special cells and vacuum equipment for handling ozone, and low temperature cells for studying molecular clusters will be designed and constructed. The spectroscopy of stratospheric neutral clusters is presently completely unknown in the vacuum ultraviolet region and it may be profitable to subject analogous but simpler prototype clusters to preliminary study.

Supporting agency address information: AF Cambridge Research Laboratories LK, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0031, THERMOLECULAR REACTIONS
D. GOLOMB, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - environmental impact statements of high altitude aircraft operations. Deficiency - the formation rate of polyatomic molecules are not known accurately as a function of temperature. Research - measure the thermolecular chemical reaction mechanisms, rate constants, temperature effects, radiative excitation and quenching. How research contributes - these laboratory studies will contribute fundamental knowledge to understand stratospheric chemistry, high altitude aircraft wake reactions, and condensation phenomena in adiabatically expanding gases.

A gas flow system has been constructed in which atomic species and simple molecules such as NO, O2 and CO can interact. The reaction products will be measured by their chemiluminescence or by resonance fluorescence. Mass-spectrometric sampling is also contemplated. The reaction vessel can be temperature controlled from 100 to 500 degrees K.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0032, CHEMICAL TRANSPORT MODELS
S.P. ZIMMERMAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - environmental impact of high altitude flight vehicle effluents. Deficiency or opportunity - chemical-transport models for determining species and thermal distributions of the normal and affected stratosphere. Objective - theoretically calculate and describe how the normal species and thermal distributions of the stratosphere are affected by flights of air force aircraft. How research contributes - uses new improved time-dependent theoretical dynamical models to determine effects of operational systems such as the B-1 on the environment.

One dimensional time-dependent dynamical model will be calculated for 60 degrees N, 38 degrees N and 5 degrees S to include coupled equations of motion and continuity for major and minor neutral species as well as experimentally determined transport coefficients for these latitudes. A one dimensional mid-latitude calculation will incorporate nitric oxide emission equivalent to those of a supersonic transport or B-1 system to test the impact on the ozone distribution and UV absorption.

Supporting agency address information: AF Cambridge Research Laboratories LK, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0033, MEASUREMENT OF STRATOSPHERIC TRACE CONTAMINANTS
A.E. LILLEY, Harvard University, Harvard College Observatory, *Cambridge, Massachusetts* 02138

A new observational technique, that of Millimeter-Wave Spectroscopy will be applied to stratospheric measurements. Because of the large spacing between lines in this spectral region, utilization of the pressure broadening information on the absorption or emission profiles can apparently permit crude height profiles of some constituents to be obtained. The technique also shows some promise for the monitoring of trace constituents such as C10, NO, etc.

SUPPORTED BY U.S. Natl. Science Foundation

5.0034, DYNAMICS OF THE SOLAR ATMOSPHERE
D.H. MENZEL, Harvard University, School of Arts, *Cambridge, Massachusetts* 02138 (F19628-75-C-0016)

AF function - communications, detection, tracking. Deficiency - inadequate precision of predictions of damaging sun induced geophysical disturbances. Research - solar magnetohydrodynamics, the physical characteristics of the solar corona and spectra line formation in the solar chromosphere. How research contributes - development of accurate techniques for predicting these disturbances. Approach - these researches would include a study of the electromagnetic forces in the solar atmosphere. These forces are important. Precise evaluation of their effects requires application of magnetohydrodynamics, whose equations and boundary conditions are often hard to apply. Static or quasi-static forces represent an oversimplification of the problem.

Supporting agency address information: AF Cambridge Research Laboratories LM, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0035, GEOPHYSICAL APPLICATIONS OF ATOMIC CLOCK RADIO INTERFEROMETRY
C.C. COUNSELMAN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139

Experimental research leading to geophysical applications of very- long-baseline interferometry (VLBI) will be continued. Under previous support, a large number of experiments were performed, utilizing new methods and equipment. The stated goal -- the reduction of the uncertainty in baseline determination from the meter to the decimeter level -- was accomplished. The R.M.S. spread about the mean from 9 separate experiments involving antennas 3900 km apart was under 25 cm, yielding a fractional error of about 6 parts in 10 to the 8th power.

For the renewal period, it is hoped to reduce the uncertainty in transcontinental baseline determination to the centimeter level. This reduction will be accomplished by calibration of the instrumentation, the neutral atmosphere, and the ionosphere. Appropriate improvements in theoretical models and in computer programs are also required.

SUPPORTED BY U.S. Natl. Science Foundation

5.0036, RESEARCH ON WIND ENERGY CONVERSION SYSTEMS
R.H. MILLER, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139

This project will address three key related problem areas of wind energy systems. The tasks include the establishment of control strategies to maximize power output while being compatible with rotor dynamics and other system constraints. Loading in the presence of wind shear will be investigated experimentally with wind tunnel tests of rotor models with suitable similarity characteristics and under conditions of wind shear, vertical and horizontal gusts and off-axis wind vectors. Aeroelastic stability margins will be examined analytically for a family of parameters and ranges. Experimental results from Task 2 will be compared with the analytical methods and analyses performed under Task 3.

SUPPORTED BY U.S. Natl. Science Foundation

5.0037, THE VAN ALLEN CONNECTION - A FILM ABOUT THE EARTH'S MAGNETOSPHERE
R.H. EATHER, Boston College, School of Arts, *Chestnut Hill, Massachusetts* 02167

This award provides partial support for the production of a film on the earth's magnetosphere. Scientific understanding of the solar- terrestrial environment has largely come about the last 15 years. The dramatic change in our conception of the near-earth environment can be seen when it is realized that it was only with the advent of satellites that the existence of the Van Allen belt was confirmed. Dr. Robert Eather proposes to focus his film on the current status and findings of magnetosphere physics and will heavily rely on research footage gathered from the study of the most visible evidence of the magnetosphere, the Aurora Borealis.

The film will be produced by Intent Films, Inc. of Cambridge, Mass. with the assistance of a testing scientific advisory committee that includes Hamnses Alfven, Walter Orr Roberts, Thomas Gold and James van Allen. The film will be shown over the Public Broadcasting System next fall.

Other funds in support of the project have been received from the NASA Space Flight Center.

SUPPORTED BY U.S. Natl. Science Foundation

5.0038, IONOSPHERIC SOUNDING
K. BIBL, Lowell Technological Institute, Graduate School, *Lowell, Massachusetts* 01854 (F19628-74-C-0063)

AF function - ionospheric specification. Deficiency - insufficient and inadequate data available to specify the ionosphere over a large altitude range on a continuous basis. Research - to obtain vertical ionospheric electron density profiles on a continuous basis. How research contributes - this input is directed toward the study of the structure of the E and F layers of the ionosphere and its relation to HF propagation. The approach used here involves a relatively high sampling rate for the study of short-term phenomena as well as diurnal and seasonal variations in order to provide a more complete picture of the behavior of the ionosphere.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0039, CATALOG OF GEOTIDAL VARIATION MAPS
UNKNOWN, Woods Hole Oceanographic Inst., *Woods Hole, Massachusetts* 02543 (NAS 6-2585)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0040, EXPERIMENTAL AND THEORETICAL AIRGLOW STUDIES
A.F. NAGY, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106

This work has been related to high resolution spectroscopic observations of natural atmospheric optical emissions carried out with the facilities of the Michigan Airglow Observatory. The Michigan Airglow Observatory was constructed under the National Science Foundation Facilities Grant GA-788 in 1967/68 and has since been improved under succeeding NSF grants. At the present time primary operational equipment consists of a six-inch Fabry-Perot interferometer, a four-channel tilting filter photometer, a scanning sector photometer, and a single channel photometer used in conjunction with the interferometer. These instruments are, generally, housed in the Michigan Airglow Observatory (MAO), which contains the multiplexing and digital recording systems.

The observatory is used to study a wide range of atmospheric problems. One of the most important studies is that related to the atmospheric winds. The Doppler shifted emission lines are used to determine winds in a nearly inaccessible region. Similar measurements of lines originating from ionic species are used to deduce electric fields. Theoretical research interpreting these data is also supported by this grant.

SUPPORTED BY U.S. Natl. Science Foundation

5.0041, INVESTIGATIONS OF ELECTROMAGNETIC SCATTERING BY COLUMNAR ICE CRYSTALS
H. WEIL, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (NSG 5044)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0042, RED CLAY TURBIDITY IN WESTERN LAKE SUPERIOR
M. SYDOR, Univ. of Minnesota, School of Liberal Arts, *Duluth, Minnesota* 55812

The objective is to produce estimates of the effects of red clay turbidity on the western Lake Superior and thereby assess the 'red clay' problem in western Lake Superior. The problem is associated with degredation of water quality in the lake and is often blamed on the high water levels of the lake.

Transport of the red clay turbidity and its dispersion in Lake Superior wil be monitored using in situ measurement on currents, turbidity measurements, and their correlation with remote sensing data from satellites and aircraft.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0043, ATMOSPHERIC CLOUDS
P.L. PLUMMER, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202 (NAS 8-31150)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0044, AERO-TURBINES AS AN ENERGY SOURCE
J.H. HAAGH, Hogere Technische School Breda, *Breda, Netherlands*

Design, construction, and testing of an aero-turbine constructed according to model rules.

SUPPORTED BY Netherlands Government - the Hague

5.0045, VERTICAL AXIS WIND TURBINES
A.W. SLEEWIJK, Rijksuniversiteit Te Groningen, *Groningen, Netherlands*

Main lines of investigation: 1. low-velocity intermediate technology wind turbines; 2. high-velocity wind turbines for electricity generation.

The purpose of investigating low velocity panemones is to obtain quantitative data regarding wind-mill types having been used in primitive technology, but the use of which has not widely spread (China, Barbados etc.) The availability of data will enable local craftsmen in developing countries to manufacture these apparatuses from locally available materials: they could be used for driving irrigation machinery, rice-hulling machines etc. An open air test stand has been built for this purpose.

A modification of the Darrieus rotor, resulting in a three-bladed rotor resting on wheels which drive generators is being studied.

SUPPORTED BY State Univ. At Groningen - Netherlands

5.0046, MAGNETOPAUSE STRUCTURE FROM SATELLITE OBSERVATIONS
UNKNOWN, Dartmouth College, Graduate School, *Hanover, New Hampshire* 03755 (NSG 7097)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0047, LAND USE AND AQUATIC POLLUTION PATTERNS ON THE GREAT LAKES
R.K. HAUGEN, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755

Objective: To describe relationships of land use type and intensity to patterns of aquatic pollution detectable with remote sensing methods. To evaluate available remote sensing techniques for applications. To relate problems such as shoreline erosion, sedimentation in harbors, and environmental factors influencing water quality of navigable streams.

Approach: Map, on a large scale, land use and aquatic pollution patterns for Lake Superior and Lake Michigan utilizing multiband photography, multispectral scanners, and other state-of-the-art remote sensing devices together with satellite multispectral imagery (such as that available through the ERTS program). Areas identified as typical of various land use-aquatic pollution relationships will be more closely examined by means of large scale imagery and limited ground truth measurements. Analysis will be facilitated by digital and color densitometry and a multispectral viewer. Automatic data processing techniques will be employed later in the study to analyze changing patterns of land use and aquatic pollution.

Lake Superior and Lake Michigan do not exhibit, at the present time, catastrophic amounts of thermal or chemical pollution. However, the fate of these lakes will be the same as that of Lake Erie and Lake Ontario unless corrective steps are taken. The need for the determination of present levels of aquatic pollution and the relationship of patterns to sources of pollution is critical. It is suggested here that the existing patterns of aquatic pollution can be related to existing patterns of land use and the intensity of use. Such information is needed as a basis for legislation and physical control of polluting activities and the planning of future land uses. The principal objective of this task is to provide knowledge of present land use/aquatic pollution relationships in Lakes Michigan and Superior. This information will provide a basis for the identification of present and future problem areas. A similar study four or five years hence will provide rates of change in land use and aquatic pollution patterns to enhance this predictive capability.

SUPPORTED BY U.S. Dept. of Defense - Army

5.0048, ROCKET AND SATELLITE MEASUREMENTS OF ELECTROSTATIC WAVES DURING THE INTERNATIONAL MAGNETOSPHERIC STUDY (IMS)
M.C. KELLEY, Cornell University, Graduate School, *Ithaca, New York* 14850

This grant supports a research program aimed at studying the role of electrostatic waves in a number of geophysical processes by rocket experiments performed in the IMS program and by satellite experiments performed during the same time period. The proposed two year program encompasses the following: (1) Sixteen plasma density fluctuation detectors to be flown on sounding rockets which are part of the IMS program being conducted by scientists from West Germany. (2) Analysis of the results of six of these flights in conjunction with AC electric and magnetic field experiments. (3) Analysis of the results of two complete electrostatic wave experiments to be performed in January 1975 in the polar cusp. (4) Detailed analysis of wave measurements made during selected orbits of satellite S3-3.

SUPPORTED BY U.S. Natl. Science Foundation

5.0049, PLASMA INSTABILITIES IN THE EARTH'S IONOSPHERE AND MAGNETOSPHERE
R.N. SUDAN, Cornell University, School of Electrical Engin., *Ithaca, New York* 14850

The objective of this research is the theoretical investigation of those plasma instabilities and their nonlinear behavior that cause some of the phenomena originating in the ionosphere and magnetosphere. Phenomena of importance include E-layer irregularities in the equatorial electrojet as well as some F-region irregularities. The technique will eventually be applied to Auroral problems.

SUPPORTED BY U.S. Natl. Science Foundation

5.0050, RESEARCH PROGRAM IN CLIMATOLOGY AND METEOROLOGY
E. ISAACSON, New York University, School of Arts, *New York, New York* 10003 (NSG 5034)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0051, A SEARCH FOR RADIO AURORAL PLASMA LINE SCATTERING
J.B. MINKOFF, Riverside Research Institute, *New York*, *New York* 10027

This grant will allow the testing of some important theories in plasma physics. The existence or nonexistence of plasma-line signals in the aurora will aid in the definition of the processes operating in the radar auroral echoes.

SUPPORTED BY U.S. Natl. Science Foundation

5.0052, WAVE PROPAGATION IN THE NEUTRAL AND IONIZED ATMOSPHERE
W.L. DONN, Columbia University, Lamont Doherty Geolog. Observ., *Palisades*, *New York* 10964

Infrasonic observations yield a great deal of information with regard to various disturbances in the atmosphere; these include severe storms, meteors, and generation of gravity waves by winds. Study of these effects yields considerable information on stratospheric phenomena including stratospheric warmings and winds.

SUPPORTED BY U.S. Natl. Science Foundation

5.0053, INVESTIGATE THE PROPERTIES, STRUCTURE, AND DYNAMICS OF EARTH MATERIALS
T. TANAKA, Ohio University, School of Arts, *Athens*, *Ohio* 45701 (NAS 5-20885)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0054, ATMOSPHERIC HIGH ENERGY NEUTRONS
G.M. FRYE, Case Western Reserve Univ., School of Arts, *Cleveland*, *Ohio* 44106

The research program has two primary objectives. One is to measure the atmospheric high energy neutron intensity as a function of energy, direction, geomagnetic latitude, and atmospheric depth. The second is to detect high energy neutral solar radiation (neutrons and gamma-rays) emitted during solar disturbances.

A detector is being developed for Extended Observation of Solar and Cosmic Radiation (EOSCOR) which will make use of the superpressure balloon system now being developed by NCAR. The superpressure balloon will provide flights of several months, duration and thus will make possible long term observation of the sun over the next solar cycle.

SUPPORTED BY U.S. Natl. Science Foundation

5.0055, STUDY OF THE NATURE OF ATMOSPHERIC VARIABILITY REPRESENTED BY DATA OBTAINED ON AVE EXPERIMENT
R.L. INMAN, Univ. of Oklahoma, School of Arts, *Norman*, *Oklahoma* 75069 (NAS 8-31333)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0056, APPLIED AERODYNAMICS OF WIND POWER MACHINES
R.E. WILSON, Oregon State University, School of Engineering, *Corvallis*, *Oregon* 97331

The objective of this project is to extend the work on applied aerodynamics of wind power machines to cover the optimum horizontal axis rotor, the Darrieus and Savonius vertical axis rotors, and the high solidity low tip speed rotor. The configuration and performance of the theoretically optimum horizontal axis rotor will be developed to enable comparisons with actual designs. The flow model of the Darrieus rotor will be refined to include unsteady stall, wake crossing, and non-linear aerodynamics effects appropriate for the deflected motions of the blade. The high solidity, low tip speed rotor (such as the farm-type windmill and the Chalk 'bicycle-wheel' turbine) will be analyzed, including effects of interference of blades. The Savonius rotor, useful for its simplicity or as a starter for the Darrieus rotor, will be analyzed starting with an existing inviscid flow model. The final report, after review by expert aerodynamicists, will be widely distributed and will provide charts and curves for preliminary design comprehensible to wind power generalists.

SUPPORTED BY U.S. Natl. Science Foundation

5.0057, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P
J.N. BARDSLEY, Univ. of Pittsburgh, School of Arts, *Pittsburgh*, *Pennsylvania* 15213 (DAHC04-73-C-0037)

Study pseudopotential calculations. Optics, plume physics phenomena of ARPA interest, such as re-entry, nuclear blackout, exhaust plumes, etc., involve a whole host of quantities which presently can neither be measured nor calculated, but which might become calculable as a result of these theoretical investigations.

It is proposed to develop techniques for accurate calculations involving large atoms without explicit representation of the core electrons. Concentration will be on the calculation of energy levels and cross sections for eleastic scattering. The program is proposed to be developed in several ways: (a) the calculation of oscillator strengths and radiative life times, and (b) the cross sections for electronic excitation, in both electron and heavy particle collisions, will be studied with varying degrees of sophistication. Variational methods will be applied for electron scattering, and semi-classical techniques for heavy particle collisions, and (c) the possibility of including spin- orbit forces explicitly in the pseudopotential will be explored.

Supporting agency address information: AMD Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0058, LABORATORY STUDY OF CHEMICAL REACTIONS OF IMPORTANCE IN THE STRATOSPHERE
UNKNOWN, Penn. State University, School of Engineering, *University Park*, *Pennsylvania* 16802 (055845 (TRAIS NO.))

The contractor shall: 1. Plan and conduct investigations and laboratory experiments in a study of chemical reactions of: a. HO2 with NO; b. HO2 with NO2 (It is intended to establish absolute rate constants as well as the ratio of rate constants for reactions Ia and Ib.), c. CH302 with NO; d. The photolysis of ozone (O3) at 3130 and 2288 angstroms; e. CH302 with NO2; f. CH302 with 03; and g. CH30 with 03.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0059, WATER RESOURCE SYSTEM MANAGEMENT FOR INCREASED POWER PRODUCTION
L.R. BEARD, Univ. of Texas, Ctr. Res. in Water Resources, *Austin*, *Texas* 78712

The general objective is to develop technology for determining the optimum integration of a large hydroelectric power system into a predominately thermal power system in order to produce maximum usable energy as well as peaking capability, while considering the seasonal variation of trade-offs with other water resource system functions such as flood control, water supply, recreation and low-flow regulation. The specific objective is to develop, in coordination with the Corps of Engineers and Southwest Power Administration, specific operation criteria for 13 major reservoirs and 11 hydropower plants in the Arkansas River Basin that would maximize the generation of power consistent with other system functions and environmental considerations. Pertinent data and computer programs will be developed for optimizing overall system power generation, using seasonally varying value functions for water resource system outputs, using iteration and/or linear and dynamic programming procedures.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0060, SCIENTIFIC INVESTIGATION IN THE GULF AND CARRIBEAN IN CONNECTION WITH CALYPSO EXPERIMENT
J. CREASTEAU, Texas A & M University System, Graduate School, *College Station*, *Texas* 77843 (NAS 5-20877)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0061, RESEARCH INITIATION - A SUBSONIC GERDIEN CONDENSER EXPERIMENT FOR UPPER ATMOSPHERIC RESEARCH

J.D. MITCHELL, Univ. of Texas, Graduate School, *El Paso, Texas* 79902

This research program is concerned with the instrumentational development of a simplified Gerdien condenser payload suitable for flight on a standard meteorological rocket. The instrument would be deployed on a parachute after separating from the rocket at apogee and would be designed to subsonically measure charge number density and ion mobility in the 30 to 70 kilometer altitude region. Measurement of these parameters will supplement presently used in situ techniques such as the blunt probe experiment which is limited to measuring electrical conductivity. Since meteorological parameters such as air temperature and wind speed have a significant influence on the ionization processes in the upper atmosphere, the Gerdien condenser's launch will be conducted in conjunction with the launching of a Meteorological Rocket Network temperature sonde.

The second aspect of this research involves the analysis of the data. Particular emphasis will be placed on characterizing the physical processes which influence stratospheric and lower mesospheric ionization as deduced from the Gerdien condenser measurements. The results of the analysis will be useful in furthering the understanding of the upper atmosphere's electrical structure and also in the study of possible relationships between ionization and meteorological processes.

SUPPORTED BY U.S. Natl. Science Foundation

5.0062, ARTIFICIALLY INDUCED PARTICLE PRECIPITATION NEAR L EQUALS 4

W.R. SHELDON, Univ. of Houston, School of Arts, *Houston, Texas* 77004

During July 1975 there will be a concentrated, multitechnique campaign to detect wave-particle activity with surface and balloon-borne instrumentation. The instruments will be situated near and above Roberval, Quebec, Canada. In a continuation of the U. of Houston, U. of Maryland and Stanford U. collaboration, the U. of Maryland has agreed that the U. of Houston will mount electric field detectors on four of the U. of Maryland balloons which will be launched for the primary purpose of detecting electrons precipitated as a result of wave-particle interactions. The electric field measurements will be made with the Double Probe Sensors. The electric field measurements will reduce the difficulty of interpreting and understanding the results of triggered emission experiments through an increase in knowledge of the ambient electrodynamic situation. It will also be possible to compare electric field and VLF measurements of the N-S component of the geo-electric field. Finally, it will be possible to detect electric fields of atmospheric origin and local lightning activity and to investigate how these phenomena influence the magnetosphere.

SUPPORTED BY U.S. Natl. Science Foundation

5.0063, IONOSPHERIC IRREGULARITIES

W.B. HANSON, Univ. of Texas, Inst. For Physical Sciences, *Richardson, Texas* 75080

The subject of ionospheric irregularities is becoming increasingly popular in no small measure because of the diagnostic techniques we developed and utilized in the past reporting periods. It is proposed to continue these irregularity investigations with essentially a new generation of diagnostic techniques, both satellite and ground based, that are capable in combination of providing very high time and spatial resolution of both the plasma concentration and motions.

SUPPORTED BY U.S. Natl. Science Foundation

5.0064, UPPER ATMOSPHERIC STUDIES USING COMBINED INCOHERENT SCATTER, PHOTOMETRIC, AND SATELLITE BORNE MEASUREMENTS

W.B. HANSON, Univ. of Texas, Inst. For Physical Sciences, *Richardson, Texas* 75080

This research includes the study of temporal and spatial variations of many atmospheric parameters including neutral density, O2, O2/N2 ratios, airglow, and ionospheric parameters. The advantages of both satellite systems and incoherent scatter are expoited.

SUPPORTED BY U.S. Natl. Science Foundation

5.0065, STUDY SCANNING ELECTRON MICROSCOPY GLASS PARTICLES PRODUCED BY LAVA FOUNTAIN ERUPTIONS

G.H. LADLE, Brigham Young University, Graduate School, *Provo, Utah* 84601 (NAS 9-14499)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0066, AN ACCURATE MEASUREMENT OF THE COSMIC RAY SIDEREAL ANISOTROPY AT HIGH ENERGIES

H.E. BERGESON, Univ. of Utah, School of Science, *Salt Lake City, Utah* 84112

Construction of a large underground detector, designed to monitor diurnal muon intensity variations and to search for transient counting rate enhancements, will be completed. It is located in a mine near Heber, Utah. The system will be capable of measuring the isotropy of the primary cosmic ray flux with a median energy of 1600 GeV to 1 part in 10 to the 4th power in one year's running time. The detector consists of three layers of 100 plastic scintillator counters each, separated by 16 in. layers of concrete. The 300 counters are under control of a TI 960A computer, which periodically records data on tape for analysis on campus. The heavy construction is finished and the remainder is well under way. Full operation of the 'observatory' is expected in late 1975.

This is a continuation of work previously supported by NSF grant MPS 7205125 A2.

SUPPORTED BY U.S. Natl. Science Foundation

5.0067, VEGETATION MAPPING OF LAKE CHAMPLAIN WETLANDS

A.O. LIND, Univ. of Vermont, School of Arts, *Burlington, Vermont* 05401

A series of detailed, large-scale vegetation maps of wetland areas in the Champlain Valley are to be produced, based on the interpretation of medium-altitude RB-57 color and color infrared aerial photography (NASA, 1972). Specifically, the many large wetland areas which interrupt the lake shore on the Vermont side and have water tables directly controlled by lake level, are to be studied. Interpretive procedure will include a densitometric evaluation of the photography and appropriate field study to establish tonal signatures for vegetation. Photo interpretation will be supplemented by a rigorous program of ground verification. A technical report shall accompany the map series and establish the methodology and accuracy of the mapping project to benefit future studies of a comparative nature.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0068, SATELLITE ALTIMETRY STUDIES

A. MANCINI, U.S. Army, Res. Inst., *Fort Belvoir, Virginia* 22060

Develop efficient algorithms for using satellite altimetry measurements for gravity determinations, exploit the use of sattelite-to-satellite tracking using the conservation of energy principle for geopotential solutions, and develop a broad definition of a DOD satellite altimeter program. This will have special implications for the national missile program since these are the most promising techniques to reduce the g/g error budget for trajectories over land and sea.

Altimeter measurements can be used as a total range, range-differences, used with a known or unknown orbit or used as undulations. The undulation problem will be investigated to derive a general solution (inverse of stokes) for getting gravity anomalies at sea and the range and range-differences will be investigated to derive deflections of the vertical at sea. The accuracy of orbits

will be investigated to determine the position and velocity vectors. These quantities will be used to derive potential coefficients through the energy integral for both land and ocean areas. Various gravity field data will be used and analytical findings will be tested by numerical simulations plus data from GEOS-C (sponsored by DMA under the GEOS-C Exploitation Plan).

Supporting agency address information: OCE ETL Research Institute, Ft. Belvoir, Va. 22060

SUPPORTED BY U.S. Dept. of Defense - Army

5.0069, PARAMETERIZATION OF GASEOUS CONSTITUENCIES CONCENTRATION PROFILES IN THE PLANETARY BOUNDARY LAYERS
E.C. KINDLE, Old Dominion University, School of Science, *Norfolk, Virginia* 23508 (NSG 1127)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0070, UPPER ATMOSPHERE EXCITATION
K.C. CLARK, Univ. of Washington, School of Arts, *Seattle, Washington* 98105

This grant supports a broad program of both laboraotry work and optical observations of the atmosphere. The laboratory work includes studies of metastable processes in gaseous discharges such as collision induced emission from O(IS) and the measurement of excitation cross sections by protons and hydrogen N2. The optical observations are performed at the Battelle Northwest facilities in Richland, Washington. Studies of diffuse auroral forms and stable auroral arcs are both included in their work.

SUPPORTED BY U.S. Natl. Science Foundation

5.0071, DYNAMIC METEOROLOGY OF THE STRATOSPHERE AND MESOSPHERE
J.R. HOLTON, Univ. of Washington, School of Arts, *Seattle, Washington* 98105

The objective of the proposed research is to develop a simplified numerical model for study of planetary scale wave motions in the stratosphere and mesosphere. The longitudinal dependence of all fields will be represented by a highly truncated series of zonal harmonic components while the latitudinal and height variations will be represented by a finite difference mesh. The model will be used to investigate the role of planetary waves and mean meridional motions in coupling the zonal wind systems of the tropics and high latitudes, specifically the following: (1) Planetary wave propagation in the polar stratosphere; (2) The stratospheric sudden warmings; (3) The quasi-biennial oscillation; (4) The semi-annual oscillation; (5) Baroclinic instability in the mesophere.

There will be an additional effort devoted to analysis of data on the lower tropical stratosphere acquired during GATE.

SUPPORTED BY U.S. Natl. Science Foundation

5.0072, INNOVATIVE VERTICAL AXIS WIND MACHINES
R.E. WALTERS, West Va. University, School of Engineering, *Morgantown, West Virginia* 26506

This project is one of a series of research efforts to investigate advanced and innovative wind energy system concepts. The objective of this project is to examine two innovative vertical axis wind turbines. Theoretical aerodynamic, structural, and cost analyses of circulation control and vortex jet vertical axis wind turbines will be performed. The circulation control vertical axis turbine will be studied using quasi-steady two-dimensional flow analysis. This device will use boundary layer control to increase lift and maximize torque. The vortex jet will also be an analytical study to design a wing for maximum induced drag and rapid vortex roll-up. This device uses the tip vortex to provide suction for a high-speed internal turbine. A structural study will follow each aerodynamic analysis, and preliminary costs will be determined from these aerodynamic and structural requirements.

SUPPORTED BY U.S. Natl. Science Foundation

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, VIEW ON PILOT PERFORMANCE
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Bakersfield, California* 93309 (NCA 2-10502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, HUMAN PERFORMANCE UNDER SELECTED ENVIRONMENTAL STRESSORS
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NCA 2-80401)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, RELATIONSHIPS BETWEEN ENDOCRINE, PHYSIOLOGICAL, AND METABOLIC CHANGES DURING BEDREST
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NCA 2-80501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, NEUROPHYSIOLOGICAL ESTIMATES OF HUMAN PERFORMANCE CAPABILITIES IN AEROSPACE SYSTEMS
W.R. ADEY, Univ. of California, School of Medicine, *Los Angeles, California* 90024 (F44620-75-C-0030)

AF function - the physiological and psychological demands on USAF personnel operating high performance aircraft and other systems can seriously limit operator performance. Effects of these stresses can be subtle and difficult to measure, yet even minor deterioration may carry serious risk for mission accomplishment. Deficiency - development of non-invasive models is needed to offer warnings of impending failure of performance before dangerous deterioration occurs. These models should be based on the monitoring of physiological and neurological parameters that are proven to be reliable indicators. Research - the goals will be achieved through determination of physiological estimators of stress during human task performance, recognition of medical status in performing operators and understanding of mechanisms underlying response to severe stresses. How research contributes - this research supports identified areas of RO 1.5, 1.6, and 1.7 and AMD TPOS in the same areas.

Supporting agency address information: AF Office of Scientific Research NL, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, EFFERENT MODULATION OF BEHAVIORAL AND NEURONAL HABITUATION
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45414)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0006, IN VIVO DETERMINATION OF ZONE PROPERTIES FROM MECHANICAL MEASUREMENTS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45504)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0007, BRAIN SEROTONIN AND PITUITARY-ADRENAL FUNCTION
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45503)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0008, GLUCOCORTICOID FEEDBACK SITES IN DOG BRAINS
UNKNOWN, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-65401)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0009, COMPARATIVE ANATOMICAL SURVEY OF THE HABENULAR NUCLEAR COMPLEX IN MAMMALS
UNKNOWN, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-65301)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0010, ECOLOGICAL FACTORS INVOLVED IN MAINTENANCE OF SKIN FLORA
UNKNOWN, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-65402)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, EFFECTS OF HEAVY PARTICLE RADIATION OF THE MAMMALIAN BRAIN AND RELATED TISSUES
W.E. HAYMAKER, Univ. of San Francisco, Graduate School, *San Francisco, California* 94117 (NSG 2063)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, INFLUENCE OF VARIOUS DIETS ON SOME BIOLOGICAL PARAMETERS IN ANIMALS
UNKNOWN, Univ. of San Francisco, Graduate School, *San Francisco, California* 94117 (NCA 2-70501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0013, THE DEVELOPMENT OF SUPEROXIDES AS IMPROVED OXYGEN SOURCES FOR BREATHING APPARATUS
L.A. SPITZE, Calif. State Univ. & Colleges, School of Natural Sciences, *San Jose, California* 95114 (NSG 2066)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0014, STUDY OF THE TOXIC EFFECT OF AMMONIA ON MICROORGANISMS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75506)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0015, RESEARCH ON MOTION SICKNESS
W.H. JOHNSON, Univ. of Toronto, *Toronto, Ontario, Canada* (NSG 7079)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0016, RESEARCH PROBLEMS IN ENVIRONMENTAL PHYSIOLOGY AND ECOSYSTEM ECOLOGY
D. CHALLINOR, Smithsonian Institution, *Washington, District of Columbia* 20560 (F44620-75-C-0052)

AF function -- the Air Force in its day to day operations, in the performance of special missions, and in developing/testing new systems, interferes with the environment. Legislation directs attention to these problems including such matters as waste disposal, effects of noise and electromagnetic radiation on people and wildlife, control of bats and birds hazardous to aircraft and unfavorable influences on surrounding communities. Deficiency -- ecosystem ecology aims at understanding how man's ecological systems are put together and how they work in nature. It is necessary to learn the energy flow biogeochemical cycling, species diversity, physical and biological factors that interact to regulate the structure and function of communities. Research -- a framework of knowledge of local environments both in the U.S. And overseas may be developed. These will form the basis for modeling techniques that will be applicable at other installations. In addition, realistic ecological criteria need to be established in order to optimize the balance between the environment and Air Force operations. How research contributes -- results from these studies are relevant to ecological aspects of diseases, to the physiology of man's adjustment to extremes of climatic conditions and supports AFSC R.O. 1.9, environmental quality and AFWL requirements relative to bird/aircraft collision hazards.

Supporting agency address information: AF Office of Scientific Research NL, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0017, STUDY ON METABOLISM AND ENERGETICS IN HYPO-GRAVITY
S.M. SIEGEL, Univ. of Hawaii, School of Arts, *Honolulu, Hawaii* 96822 (NAS 2-8687)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0018, LOCALIZATION AND HISTO-CHEMICAL CHARACTERIZATION OF THE CENTRAL EMETIC APPARATUS - MOTION SICKNESS
UNKNOWN, Tulane University of Louisiana, Graduate School, *New Orleans, Louisiana* 70118 (NCA 2-00402)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0019, ANTECEDENTS OF ACHIEVEMENT AND CREATIVITY
R.L. HELMREICH, Univ. of Texas, School of Arts, *Austin, Texas* 78712 (NSG 2065)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0020, CARDIOVASCULAR EFFECT OF VARIATIONS IN HABITUAL LEVELS OF PHYSICAL ACTIVITY
C.G. BLOMQUIST, Univ. of Texas, School of Medicine, *Dallas, Texas* 75230 (NSG 9026)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0021, EVALUATE PRIMARY IRRITANCY AND ALLERGENICITY OF MATERIALS PROPOSED FOR CREW APPAREL
W.C. DUNCAN, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14407)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0022, RESEARCH STUDY ON METABOLISM AND ENERGETICS IN HYPOGRAVITY
C.H. WARD, Rice University, School of Humanities, *Houston, Texas* 77001 (NAS 2-8676)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0023, INVESTIGATION OF BIOLOGICAL LIPID PEROXIDATION
UNKNOWN, Univ. of Houston, Graduate School, *Houston, Texas* 77004 (NCA 2-95503)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0024, WEST TEXAS EMERGENCY MEDICAL SERVICE CONFERENCE
W.M. PORTNOY, Texas Technological University, School of Engineering, *Lubbock, Texas* 79409 (NAS 9-14438)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0025, CONDUCT 50 BONE ASSAYS AND 200 SERUM PTH ASSAYS
D.J. BAYLINK, Univ. of Washington, Graduate School, *Seattle, Washington* 98105 (NAS 2-8541)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0026, INVESTIGATION OF PERIPHERAL BLOOD FLOW AS A THERMOREGULATORY FUNCTION
W.C. KAUFMAN, Univ. of Wisconsin, Graduate School, *Green Bay, Wisconsin* 54302 (NSG 9017)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0027, SURVEILLANCE - VISUAL DYNAMICS IN PROCESSING A SERIES OF DISPLAYS
G.H. ROBINSON, Univ. of Wisconsin, School of Engineering, *Madison, Wisconsin* 53706 (N00014-75-C-0364)

Visual search, monitoring, information-handling, and choice behavior nearly always occur in situations where data from multiple sources are acquired and integrated by a human operator, but most of our search models, data base, and theory are built upon an additive assumption of separate, single elements in the visual scene. A recent review on visual search models has revealed that such an additive assumption is not tenable for the prediction of human performance in complex behavior. The proposed research effort quantifies how an operator searches multiple, spatially-separated displays in both monitoring and control tasks and elucidates the serial processes and their characteristics that are operative in complex tasks.

The band width (rate of change) of command signals, the dynamics of the controlled system, the dimensions of the task (i.e., discriminability, complexity, and angular location), and the operator characteristics (i.e., uncertainty, risk, and use of cueing) are varied in order to establish the performance functions when operators search across two or more information sources. Total reaction-time, error rate, tracking error, and eye-head dynamics are measured during the tasks of monitoring, controlling, and combinations of both. A simulation of an aircraft cockpit that requires display-control integration is the test bed for these studies which extend over a series of four separate experiments. The functions that are derived are cast into a form suitable for utilization by design engineers of man-machine systems, and incorporated into mathematical models which permit generalization.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, COMPARISON OF REAL-TIME DIGITAL ALGORITHMS FOR THE EXTRACTION OF PITCH IN SPEECH
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NCA 2-90501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0002, STUDIES OF COMPILER IMPLEMENTATION
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45515)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0003, PARTIAL DIFFERENTIAL EQUATIONS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-60502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0004, AUTOMATIC DOCUMENTATION SYSTEM TO MEASURE, IMPROVE, AND PREDICT SOFTWARE RELIABILITY
D.B. SIMMONS, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (NAS 5-20715)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, SCALABLE STANDARD OPTICAL SOURCES IN VUV - EMISSIONS FROM ELECTRON IMPACT ON METALS
R.H. HUGHES, Univ. of Arkansas, School of Arts, *Fayetteville, Arkansas* 72701 (NSG 7106)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0002, NEUTRON ENERGY SPECTRA AND DOSE RATES AT AIRCRAFT ALTITUDES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75413)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0003, LOW BETA STELLARATORS, 1.5 GJ SHOCK CURRENT GENERATOR
M. KOTTMAIR, Max Planck Inst. Fur Plasmaphy, *Munich, Federal Republic of Germany*

Keyword description and long range goals: Flywheel converter with 1.45 GJ useable energy and 100 MW flat-topped output with a 15 s pulse duration, to supply the W VII, including supply and return conductors for the electrical power.

Full description of the work planned for 1975: The generator will be completed in 1974.

SUPPORTED BY Max Planck Gesellschaft - Munchen

8.0004, QUANTITATIVE PROPAGATOR METHODS FOR MOLECULAR SYSTEMS
Y. OHRN, Univ. of Florida, School of Arts, *Gainesville, Florida* 32601 (AF-AFOSR-2656-74)

The duration and intensity of the infrared background in a nuclear burst depends on the cross sections for excitation of diatomic molecules. This research is concerned with development

of propagator methods that will allow direct theoretical determination of absorption frequencies and intensities in molecular spectra and direct calculation of excitations or de-excitations and cross sections in collision processes, without separate calculation of the state wavefunctions. These methods take information on atomic orbitals and energy levels and, without the introduction of any parameters, permit the calculation of molecular properties.

Supporting agency address information: AF Office of Scientific Research NPP, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0005, IX INTERNATIONAL CONFERENCE ON THE PHYSICS OF ELECTRONIC AND ATOMIC COLLISIONS 12796-P
R. GEBALLE, Univ. of Washington, School of Arts, *Seattle, Washington* 98105 (DAHC04-75-G-0053)

Support of one of the principal gatherings of physicists and chemists concerned with atomic and molecular collision processes. Relevance - the papers presented will represent an overview of the latest research in atomic physics throughout the world. Atomic physics research is fundamental to a variety of Army problems including the disturbed atmosphere, and certain types of gaseous electronic devices such as molecular lasers.

A program of invited papers, invited progress reports and contributed papers is being prepared for a five-day schedule. The conference will deal generally with two-body interactions among ions, atoms, simple molecules, electrons (negative and positive), and photons. The collision energies of interest range from subthermal to millions of electron volts (where processes of inner-shell excitation are now being explored).

Supporting agency address information: AMC Army Rsch. Office, (ARO- D), Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, STUDY OF SELECTED MANAGEMENT SYSTEMS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45426)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0002, PROGRAM FOR TRANSFER RESEARCH AND IMPACT STUDIES
J.E. FREEMAN, Univ. of Denver, Graduate School, *Denver, Colorado* 80210 (NASW 2766)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0003, EXPLORING CAREERS IN TECHNOLOGY
L.F. CRAWLEY, Virginia State College, Graduate School, *Petersburg, Virginia* 23806 (NSG 1007)

Purpose: The purpose of this summer institute was to provide a research and development environment in which Industrial Arts Teachers could gather information for planning classroom activities through which students may explore careers in the technologies.

Objectives: (1) The identification of new developments and careers in the technologies. (2) The development of Technical Career Experience Packages.

Approach: Fifteen Industrial Arts Teachers were chosen from the five-state area served by N.A.S.A's Langley Research Center. Each teacher was assigned to work in one of the laboratories or shops with N.A.S.A. Technicians and Engineers. Each teacher had to prepare a Technical Career Experience Package. This package consisted of a write- up describing the job completely, slides depicting certain activities and characteristics about the job and a cassette narration describing the slides. These packages could be used by a student or group of students who were interested in learning about a particular occupation.

Written instructions accompanied each package, telling the student what equipment was needed to view each package. Since many students have a very limited knowledge of many different occupations and what is involved in each, using the Technical Career Experience Packages should prove quite helpful in acquainting students with some of the careers available in the world of work today.

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, AN OBSERVATIONAL AND THEORETICAL PROGRAM OF FAR INFRARED ASTRONOMY
W.F. HOFFMANN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721

Observational and theoretical far infrared astronomy will be carried out. The research will include balloon-borne far infrared observations in the 10-200 micron region. The Galactic Center, galactic HII regions, interstellar dust clouds, infrared stars, and selected portions of the Milky Way will be studied. The low thermal background of the cryogenically cooled telescope will make possible measurements of increased sensitivity. Instrumental development, testing, data analysis, and theoretical studies will be carried out at the Steward Observatory of the University of Arizona. The balloon-borne telescope will be launched from the National Scientific Balloon Facility in Palestine, Texas.

SUPPORTED BY U.S. Natl. Science Foundation

10.0002, INTO THE THEORY OF PARTICLES AND FIELDS IN SPACE
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7101)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, DATA REDUCTION AND ANALYSIS OF DATA FROM IMP I SOLAR PARTICLE EXPERIMENT
K.A. ANDERSON, Univ. of California, Space Sciences Laboratory, *Berkeley, California* 94704 (NAS 5-20838)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, PHOTOCHEMISTRY OF THE LOWER JOVIAN ATMOSPHERE
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Los Angeles, California* 90032 (NCA 2-85502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, MARINER 10
B.C. MURRAY, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7112)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, HIGH ENERGY COSMIC RAYS EXPERIMENT FOR INTERNATIONAL SUN - EARTH EXPLORER SPACECRAFT
E.C. STONE, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NAS 5-20721)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, SOLAR X-RADIATION
J.A. VORPAHL, Sacramento City College, Graduate School, *Sacramento, California* 95822

This grant supports the analysis of and comparison of several types of solar data in order to better understand active regions on the sun. The investigator will use recent X-ray structures as revealed by Skylab photographs, and will compare them with hydrogen-alpha and magnetic field data. Similarly, a correlative study will be made between solar X-radiation and Type III radio bursts. These detailed studies of flaring regions will attempt to understand the structure and basic processes of these solar phenomena.

SUPPORTED BY U.S. Natl. Science Foundation

10.0008, THERMAL HISTORY OF THE MOON AND THE TERRESTRIAL PLANETS
UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-85408)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0009, OH AND NH EMISSION STUDIES OF COMET KOHOUTEK
C.K. KUMAR, Howard University, Graduate School, *Washington, District of Columbia* 20001 (NSG 5021)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0010, STUDY OF SENSITIVE DETECTION SYSTEM FOR FAR INFRARED ASTRONOMY
R.H. HILDEBRAND, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (NSG 2057)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0011, SIMULATION OF THE EOLIAN MODIFICATION OF MARTIAN CRATERS
UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0012, IN THE ATMOSPHERE OF JUPITER
C. PONNAPERUMA, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (NAS 5-20834)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0013, ULTRAVIOLET INVESTIGATIONS OF STELLAR X-RAY SOURCES
A.K. DUPREE, Harvard University, Graduate School, *Cambridge, Massachusetts* 02138 (NAS 5-20764)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0014, EARTH SIMULATION EXPERIMENT FOR CLOUD PHYSICS LABORATORY ON SPACELAB OR SHUTTLE
J.E. HART, Mass. Inst. of Technology, Graduate School, *Cambridge, Massachusetts* 02139 (NAS 8-31149)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0015, DATA REDUCTION AND ANALYSIS OF IMP I RADIO ASTRONOMY EXPERIMENT
F.T. HADDOCK, Univ. of Michigan, School of Arts, *Ann Arbor, Michigan* 48104 (NAS 5-20839)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0016, NONLINEAR PHENOMENA IN LABORATORY AND SPACE PLASMAS
A. HASEGAWA, Unknown Inst. or Indiv. Grant, *New Jersey*

The study consists of two parts. At Nagoya University the P.I. is collaborating with Japanese scientists on a study of the dynamics of nonlinearly coupled systems of (1) three waves and (2) waves and particles. At the University of Tokyo the P.I. is collaborating with the Japanese scientists at the Institute of Space and Aeronautical Science on the triggering mechanisms of geomagnetics substorms.

SUPPORTED BY U.S. Natl. Science Foundation

10.0017, STUDIES OF SPACE COLONIZATION
G.K. ONEILL, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NSG 2062)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0018, SEDIMENTOLOGICAL STUDIES OF LUNAR CORES UTILIZING X-RAY ENHANCEMENT TECHNIQUES
N.K. COCH, City University of New York, School of Liberal Arts, *Flushing, New York* 11367 (NSG 9022)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0019, THEORETICAL ASTROPHYSICS
M.A. RUDERMAN, Columbia University, School of Arts, *New York, New York* 10027

Research supported under NSF Grant GP-32336X2 will be continued. Specific topics in theoretical astrophysics to be investigated include: 1. Theory of pulsar magnetosphere (Ruderman); 2. Pulsar radiation mechanisms (Ruderman); 3. Two fluid flows (Spiegel); a) Fluidization b) Photon Bubbles c) Bioconvection; 4. Relativistic transport theory (Spiegel); 5. Gamma-ray bursts (Ruderman); 6. Neutral currents and neutrino pair emission (Ruderman); 7. Terrestrial ozone and nearby supernovae explosions (Ruderman & Spiegel); and 8. Dense galactic nuclei (Ruderman & Spiegel).

SUPPORTED BY U.S. Natl. Science Foundation

10.0020, AN INQUIRY INTO THE LOW SEISMIC ATTENUATION OF LUNAR CRUST
E. SCHREIBER, Columbia University, Lamont Doherty Geolog. Observ., *Palisades, New York* 10964 (NSG 9025)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0021, STUDIES OF SOLAR-TERRESTRIAL RELATIONSHIPS AS MANIFESTED BY COSMIC RAY INTENSITY VARIATIONS
M.A. POMERANTZ, Franklin Inst. of State of Pa., *Swarthmore, Pennsylvania* 19081

The research program supported by this grant is directed toward the solution of a number of the important problems in solar-terrestrial physics through study of the cosmic ray effects. The investigators will conduct both analytical and theoretical investigations of the following aspects of solar cosmic rays: (1) propagations at the sun and in space; (2) anisotropies, and (3) acceleration mechanisms. Similarly, studies of the following galactic cosmic ray effects are planned: (1) long term variations, including energy hysteresis and axial gradients; (2) short-term modulations; and (3) periodicities and intensity fluctuations. Finally the properties and propagation of interplanetary shock waves will be studied in the light of their effects upon cosmic rays.

SUPPORTED BY U.S. Natl. Science Foundation

10.0022, LUNAR SEISMIC PROFILING EXPERIMENT NATURAL ACTIVITY STUDY
F.D. DUENNEBIER, Univ. of Texas, Graduate School, *Austin, Texas* 78712 (NAS 9-14405)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0023, ORIGIN OF MAGNETIZATION IN LUNAR BRECCIAS AND ITS BEARING ON THEIR FORMATION
W.A. GOSE, Univ. of Texas, Graduate School, *Austin, Texas* 78712 (NSG 9021)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0024, INVESTIGATION OF CHLORINE ABUNDANCES IN EARLY-TYPE STARS
S.B. PARSONS, Univ. of Texas, Graduate School, *Austin, Texas* 78712 (NSG 5031)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0025, LUNAR SAMPLE IRRADIATION SERVICES
J.D. RANDALL, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (NAS 9-14429)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0026, ORIGIN, EVOLUTION, AND CRYSTALLIZATION OF LUNAR MAGMAS
W.P. NASH, Univ. of Utah, Graduate School, *Salt Lake City, Utah* 84112 (NSG 9024)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0027, STUDY OF SATELLITE REMOTE MEASUREMENTS OF STRATOSPHERIC AEROSOL AND GAS PARAMETERS USING SOLAR OCCULTATION TECHNIQUE
W.P. CHU, Old Dominion University, Graduate School, *Norfolk, Virginia* 23508 (NSG 1108)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, OPERATION OF THE WESTERN RESEARCH APPLICATIONS CENTER
UNKNOWN, Univ. of Southern California, Graduate School, *Los Angeles, California* 90007 (NASW 2771)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, OPERATION OF THE TECHNOLOGY APPLICATION CENTER
UNKNOWN, Univ. of New Mexico, Graduate School, *Albuquerque, New Mexico* 87106 (NASW 2633)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0003, RESEARCH AND DEVELOPMENT AND TECHNICAL OPERATIONS SUPPORT
UNKNOWN, New Mexico State University, Graduate School, *Las Cruces, New Mexico* 88001 (NAS10-8712)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0004, OPERATION OF REGIONAL DISSEMINATION CENTER
UNKNOWN, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (NASW 2674)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-21219# Advisory Group for Aerospace Research and Development, Paris (France).
TAKE-OFF AND LANDING
Jan. 1975 300 p refs Presented at 44th Meeting of the Flight Mech. Panel of AGARD, Edinburgh, 1-4 Apr. 1974 (AGARD-CP-160) Avail: NTIS HC $8.75

The proceedings of a conference on aircraft takeoff and landing are presented. The subjects discussed include the following: (1) aircraft design optimization, (2) energy management, (3) aircraft stability and control characteristics, (4) aircraft guidance using ground based and airborne equipment, and (5) operational aspects of approach control with short takeoff aircraft. For individual titles, see N75-21220 through N75-21241.

N75-21220* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH-LIFT AERODYNAMICS: TRENDS, TRADES, AND OPTIONS **c05**
Richard J. Margason and Harry L. Morgan, Jr. *In* AGARD Take-off and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

The trend toward the utilization of higher maximum lift coefficient with increased aircraft size and cruise velocities is discussed. The impact of this trend on the need for tradeoffs between cruise performance and takeoff, climb, and landing performance is examined. Theoretical methods for the analysis of the two-dimensional characteristics of flap systems are described and compared with experimental data. Four powered-lift concepts are described to outline some of the options currently being developed. Two jet-flap theories are described which provide analytical methods for estimation of the three-dimensional aerodynamic high-lift performance characteristics of powered lift systems. Author

N75-21221* Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
COMPATIBILITY OF TAKE-OFF AND LANDING WITH MISSION AND MANOEUVRE PERFORMANCE REQUIREMENTS FOR FIGHTER AIRCRAFT **c05**
Dieter Reich and Josef Wimbauer *In* AGARD Take-off and Landing Jan. 1975 7 p refs (For availability see N75-21219 13-01)

By means of an aircraft synthesis program, the effect of engine cycle, thrust to weight ratio, and wing parameter combination on field and flight performance has been investigated. For three different engine/intake configurations, thrust to weight ration and wing loading were varied. Each combination represents an aircraft designed to meet a specified mission radius. Using different lift systems and ground deceleration devices, the conditions are shown under which a matching of flight and field performance is economically feasible. Author

N75-21222 Aerospatiale Usines de Toulouse (France).
GENERAL CRITERIA FOR THE DEFINITION OF TAKE-OFF AND LANDING OF AN AIRCRAFT WITH NONLIMITED LIFT [CRITERES GENERAUX POUR LA DEFINITION AU DECOLLAGE ET A L'ATTERRISSAGE D'UN AVION NON LIMITE EN PORTANCE] **c05**
C. Pelagatti and T. Markham (British Aircraft Corp., Bristol, England) *In* AGARD Take-off and Landing Jan. 1975 11 p In FRENCH (For availability see N75-21219 13-01)

The performance of a slender wing aircraft configuration with unlimited lift was studied. A description is given of the approach process, aerodynamic characteristics, and certification regulations. The optimization of characteristics based on speed was developed after considering examples from the Concorde.

Transl. by E.H.W.

N75-21223* Boeing Commercial Airplane Co., Seattle, Wash.
TERMINAL AREA CONSIDERATIONS FOR AN ADVANCED CTOL TRANSPORT AIRCRAFT **c05**
Mark B. Sussman *In* AGARD Take-off and Landing Jan. 1975 14 p refs (For availability see N75-21219 13-01) (Contract NAS1-12018)

Projected future conditions at large urban airports were used to identify design objectives for a long-haul, advanced transport airplane introduced for operation in the mid-1980s. Operating constraints associated with airport congestion and aircraft noise and emissions were of central interest. In addition, some of the interaction of these constraints with aircraft fuel usage were identified. The study allowed for advanced aircraft design features consistent with the future operating period. A baseline 200 passenger airplane design was modified to comply with design requirements imposed by terminal area constraints. Specific design changes included: (1) modification of engine arrangement; wing planform; (2) drag and spoiler surfaces; (3) secondary power systems; (4) brake and landing gear characteristics; and (5) the aircraft avionics. These changes, based on exploratory design estimates and allowing for technology advance, were judged to enable the airplane to: reduce wake turbulence; handle steeper descent paths with fewer limitation due to engine characteristics; reduce runway occupancy times; improve community noise contours; and reduce the total engine emittants deposited in the terminal area. The penalties to airplane performance and operating cost associated with improving the terminal area characteristics of the airplane were assessed. Finally, key research problems requiring solution in order to validate the assumed advanced airplane technology were identified. Author

N75-21224 Service Technique de l'Aeronautique, Paris (France).
BRAKING PERFORMANCES **c05**
Georges Leblanc *In* AGARD Take-off and Landing Jan. 1975 17 p In FRENCH; ENGLISH summary (For availability see N75-21219 13-01)

During Landing or aborted take-off, the braking distances are depending on the speed allowed by high lift devices and on the Kinetic energy which must be absorbed by the braking systems according to the available friction coefficient of tire runway. Studies on this last point have not yet been so extensive as aerodynamic studies. Beside obvious interest for performances, it is necessary

to know how to determine the safety margins which have to be taken on braking distances according to actual conditions of the runway. For the prediction of braking distance a comprehensive scheme of friction phenomena on wet runway according the three zone's GROUCH model is proposed. The test results obtained with CARAVELLE Aircraft confirm that the proposed model is correct and that it can give a satisfactory prediction of the braking distance. Author

N75-21225 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
TRADEOFF PARAMETERS OF ALTERNATIVE TAKEOFF AND LANDING AIDS **c02**
Kennerly H. Digges *In* AGARD Take-off and Landing Jan. 1975 18 p refs (For availability see N75-21219 13-01)

The various aids for reducing takeoff and landing distance are discussed. The launch aids include rocket assist, catapults and powered lift. The landing aids include reversed turbojet thrust, parachutes and wheel brakes. New technology aimed at reducing the weight or increasing the performance of landing aids is indicated. The ways in which stopping distance is affected by varitions in parameters such as lift coefficient, drag coefficient, reversed thrust, landing velocity and runway friction coefficient are shown. Author

N75-21226 Royal Aircraft Establishment, Bedford (England).
A TECHNIQUE FOR ANALYSING THE LANDING MANOEUVRE **c02**
R. F. A. Keating *In* AGARD Take-off and Landing Jan. 1975 12 p refs (For availability see N75-21219 13-01)

Studies of steep gradient aviation have highlighted the need to find the underlying piloting strategy of landings. A graphic presentation of landing records is put forward which, it is hoped, will assist in the solution to this problem. By expressing the pilot's longitudinal control activity as equivalent speed and climb rate demands, it is possible to plot simultaneously the aircraft motion and the control strategy against the performance chart as a reference grid. By suitable choice of axis scaling, the aircraft's response to simple control input traces out simple geometric patterns such as circular arcs. Examples are given of flight data, principally of the HS 125 in normal, steep and two segment approaches. Power margins and target speeds are discussed for these examples. Author

N75-21227* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STABILITY AND CONTROL HARMONY IN APPROACH AND LANDING **c08**
Seth B. Anderson *In* AGARD Take-off and Landing Jan. 1975 8 p refs (For availability see N75-21219 13-01)

A review of the factors which affect stability and control harmony in approach and landing is made to obtain a clearer understanding of the proper relationship, the trade-offs involved, and to show how limits in stability and control harmony are established for advanced aircraft. Factors which influence stability and control harmony include the longitudinal short period response of the aircraft and the level of several pitch control characteristics including control power, control sensitivity, and control feel. At low stability levels for advanced aircraft, less conventional control techniques such as DLC are needed to improve harmony and some form of stability augmentation must be provided to improve precession of flight path control and reduce pilot work load. Author

N75-21228 National Aeronautical Establishment, Ottawa (Ontario).
THE INFLUENCE OF STOL LONGITUDINAL HANDLING QUALITIES OF PILOTS' OPINIONS **c08**
K-H. Doetsch, Jr. *In* AGARD Take-off and Landing Jan. 1975 17 p refs (For availability see N75-21219 13-01) (Contract F33615-71-C-1722)

Consideration is given to some of the factors which distinguish the longitudinal handling qualities of STOL aircraft from those of the CTOL class and to the influence of these differences on pilot's opinions. The effects of wind, wind-shear, trim speed, thrust vector inclination, speed coupling, pitch chracteristics and of using different control technique options on flight-path control are discussed briefly. In-flight evaluations of variations in some of these parameters provided a basis for assessing their relative importance to the pilot when he was faced with a demanding instrument approach task. Control of pitch proved to be central to the overall flight-path control task and the more easily and precisely the pilot could modulate pitch, the more adverse the speed coupling effects he was prepared to tolerate. For the typical unaugmented stability characteristics of the STOL class of aircraft exhibiting small modal separation, the handling qualities were governed by the overall responses to control and disturbance inputs rather than by the location of individual roots of the characteristic equation. Author

N75-21229 Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
LOW-SPEED STABILITY AND CONTROL CHARACTERISTICS OF TRANSPORT AIRCRAFT WITH PARTICULAR REFERENCE TO TAILPLANE DESIGN **c08**
E. Obert *In* AGARD Take-off and Landing Jan. 1975 16 p (For availability see N75-21219 13-01)

For modern transport aircraft generally emphasis is put on operational flexibility. This means among other things that the ability is required to operate at low take-off and landing speeds under a wide range of loading conditions. Consequently the operational envelope of the aircraft covers a large range of lift coefficients and C.G. positions. The ensuing requirements for the design of horizontal tail surfaces and elevators are difficult to fulfil. Some of the low-speed tailplane and elevator problems are considered. Particular reference is made to the possibility of tailplane stall. Some related experience obtained in the design and flight testing of the Fokker-VFW F-27 and F-28 is discussed. Author

N75-21230 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
SOME LOW SPEED ASPECTS OF THE TWIN-ENGINE SHORT HAUL AIRCRAFT VFW 614 **c02**
Hartmut Griem, Juergen Barche, Hans J. Beisenherz, and Guenther Krenz *In* AGARD Take-off and Landing Jan. 1975 19 p refs (For availability see N75-21219 13-01)

The flight characteristics of the VFW 614, short haul aircraft, are discussed. The low speed aspects of the aircraft are analyzed with respect to: (1) wing stall aerodynamics, (2) tail stall aerodynamics, (3) longitudinal control, and (4) lateral/directional control. The aircraft design criteria are identified. The dimensions and configurations of the aircraft controls are tabulated. Flight test results are summarized. Author

N75-21231 British Aircraft Corp., Weybridge (England). Commercial Aircraft Div.
DIRECT LIFT CONTROL APPLICATIONS TO TRANSPORT AIRCRAFT: A UK VIEWPOINT **c08**
M. R. Smith *In* AGARD Take-off and Landing Jan. 1975 10 p refs (For availability see N75-21219 13-01)

The longitudinal controllability of large conventional transport aircraft during the approach and landing flight phases, and of conventional high lift 'STOL' aircraft during short landings, is discussed. The advantage of a direct lift control system (DLC) is indicated, and a practical design, using wing spoilers, is described, with its disadvantages. Theoretical and flight simulator investigations on the VC.10 aircraft, and the BAC 1-11 aircraft are described, together with investigations of similar systems for improving the automatic landing of current British jet aircraft. Some recent investigations on a DLC application to a STOL aircraft are noted. It is concluded that DLC applications can improve controllability and performance for most transport aircraft. A more detailed study is required for each application before its true value can be assessed, even for large transport aircraft. Application of DLC to conventional lift STOL aircraft looks attractive for achieving satisfactory flare performance. Author

N75-21232 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
INVESTIGATIONS ON DIRECT FORCE CONTROL FOR CCV AIRCRAFT DURING APPROACH AND LANDING **c08**
Wolfgang J. Kubbat *In* AGARD Take-off and Landing Jan. 1975 11 p (For availability see N75-21219 13-01)

The aerodynamic characteristics of control configured vehicles (CCV) with direct force controls (DFC) are discussed. The following

aspects are considered: (1) the influence of the controls on the natural stability, (2) the influence of DFC on the controllability of the aircraft, (3) the integration of the DFC with the control system in CCV designs, (4) the behavior of CCV aircraft with DFC during approach and landing, and (5) the relationship of the results presented in the basic CCV concept. Author

N75-21233 Yingling (George L.), Dayton, Ohio.
GUIDANCE PHILOSOPHY FOR MILITARY INSTRUMENT LANDING **c03**
George L. Yingling *In* AGARD Take-off and Landing Jan. 1975 13 p refs (For availability see N75-21219 13-01)

Instrument landing guidance philosophy for military aircraft is affected by the type of operation, the nature of the environment, the kind of aircraft involved and system dynamics considerations. Guidance philosophy and requirements are inseparable from control dynamics and tradeoffs exist between the two in arriving at an optimum solution for particular cases. In some countries, compatibility and interoperability with the civil system is considered important if not essential. The National Microwave Landing System program in the U.S.A. is of great interest internationally, and the U.S.A. Department of Defense is supporting, at present, the goal of a common civil/military system. Representative unclassified operational requirements are reviewed as a lead to discussing the various factors having an impact on choice of guidance philosophy. The single most important consideration is the choice of technique to overcome landing guidance system multipath effects. The choice of technique must satisfy the many system dynamic considerations and present field test programs must provide clear and valid engineering data upon which to base a decision. A system solution to a hypothetical but representative military situation is presented for discussion purposes. In addition a requirement for an all-airborne, self-contained landing system is discussed. Author

N75-21234 Royal Aircraft Establishment, Bedford (England).
THE IMPROVEMENT OF VISUAL AIDS FOR APPROACH AND LANDING **c09**
A. J. Smith and D. Johnson *In* AGARD Take-off and Landing Jan. 1975 15 p refs (For availability see N75-21219 13-01)

The effect of fog on the operational capability of runway lights is discussed. A study on the variations of fog gradients with altitude is reported. Improvements in approach and runway lighting to overcome the attenuation caused by fog are described. The characteristics of a precision approach path indicator for steep gradient and two-segment approaches are analyzed. The author states that landings made using the improved equipment have been achieved with a touchdown scatter that is much smaller than is normally achieved. Author

N75-21235 National Aerospace Lab., Amsterdam (Netherlands).
FLIGHT TESTS WITH A SIMPLE HEAD-UP DISPLAY USED AS A VISUAL APPROACH AID **c06**
G. L. Lamers *In* AGARD Take-off and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

A simple head-up display (HUD), giving only glide path information with a depressed horizon bar, has been tested as an approach aid in visual flight conditions. An important improvement was observed in the accuracy of the glide path performance when approaches with the use of a HUD are compared with visual approaches without an approach aid. Using the HUD decreased the standard deviations of height by a factor of 2 to 4 depending on distance from the runway. From this limited series of tests no significant differences in other flight parameters could be demonstrated. The subject pilots indicated a preference for use of the HUD during visual approaches, especially in night conditions. Author

N75-21236 Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
ALL-WEATHER LANDING SYSTEM FOR MERCURY [LE SYSTEME D'ATTERRISSAGE TOUS TEMPS DU MERCURE] **c06**
Armand Pile *In* AGARD Take-off and Landing Jan. 1975 11 p In FRENCH (For availability see N75-21219 13-01)

Principle characteristics of the AIR-INTER version of an all-weather landing system with collimators for Mercury are outlined. Transl. by E.H.W.

N75-21237 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REQUIRED PILOT CUES AND DISPLAYS FOR TAKEOFF AND LANDING **c06**
Jean-Claude Wanner *In* AGARD Take-off and Landing Jan. 1975 14 p In FRENCH; ENGLISH summary (For availability see N75-21219 13-01)

A model of pilot behavior during the takeoff and landing phases of flight was constructed. The model was used to determine the necessary cues and in turn the parameters which have to be displayed in order to minimize the pilot work load and improve flight safety. A future cockpit display was designed, based on the display parameters. The main part of the system is a head-up display presenting the ground track of the air velocity vector and the total climb angle. With these two parameters the pilot can directly control the airpath, knowing exactly the necessary rating of the engines and observing a correct safety margin for the angle of attack. Author

N75-21238 Ministry of Transport, Ottawa (Ontario).
SOME DHC-6 TWIN OTTER APPROACH AND LANDING EXPERIENCE IN A STOL SYSTEM **c05**
Richard P. Bentham *In* AGARD Take-off and Landing Jan. 1975 11 p (For availability see N75-21219 13-01)

The Canadian Government's decision to introduce a STOL demonstration service revealed a need for practical data and flight experience to assist in aircraft approval and development of safe operational procedures. From 1971 to 1973, a series of flight tests concerned with the steep approach and landing task were carried out, initially in a DHC-6-100 Twin Otter and later in a DHC-6-300S. Approach angles of 6 deg, 7 deg, and 8 deg were assessed in terms of pilot work load and aircraft touchdown and landing distances. Other relevant factors peculiar to the steep approach and landing task were investigated including transition from en-route guidance to approach guidance, crew co-ordination, night operation, missed approach and engine out missed approach, and approach turbulence and wind shear. Community noise sensitivity was closely monitored. The flight test program resulted in some modifications to the production aircraft, the development of approach and landing operating procedures and the definition of some potential problem areas. Author

N75-21239 Air Force Flight Test Center, Edwards AFB, Calif.
LOW POWER APPROACH **c08**
B. Lyle Schofield *In* AGARD Take-off and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

Discussions are presented on current final approach-to-landing procedures along with the relationship of conventional approach speeds to the lift to drag (L/D) relationships of aircraft. The characteristics of L/D relationships are discussed in view the landing approach maneuver, identifying the potential advantages of operating on the front side of the L/D curve. Flight experience of low L/D, idle power approaches using the front side of the L/D curve are reviewed in light of the piloting task. The velocity convergence relationship for operating on the front side of the L/D curve are presented and the convergent characteristics for both transport and fighter aircraft are explored. Front side approach and landing performance for the KC-135A and T-38A aircraft are presented. Convair 990 touchdown dispersions from low L/D, idle approaches are presented. Other significant advantages of the low power, front side L/D landing approach are enumerated. Author

N75-21240 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
STEEP APPROACH FLIGHT TEST RESULTS OF A BUSINESS-TYPE AIRCRAFT WITH DIRECT LIFT CONTROL **c07**
P. G. Hamel, K. K. Wilhelm, D. H. Hanke, and H. H. Lange *In* AGARD Take-off and Landing Jan. 1975 19 p refs (For availability see N75-21219 13-01)

The trends in aircraft approach and landing procedures are such that increasingly noise abatement constraints impact on vehicle flying (handling) qualities. A ground-based flight simulator program and concurrently a flight test program were conducted using a MBB-HFB-320 Hansa Jet airplane which was retrofitted with an analogue fly-by-wire flap and thrust control system. The direct-lift control system was used for alleviating handling qualities

problems during steep noise-abatement landing approaches. A variable direct lift control system was made feasible for optimization purposes by changing the gearing ratio of the electric flap-elevator interconnect. Facilitation in pilot's workload and improvements in flight path control were analyzed by statistical methods. Experiences gained by flight test results and noise measurements show that routine 2-segment noise-abatement approach paths can be introduced successfully when adequate path guidance, quick-response flight path corrections and minimum throttle activity are possible. Author

N75-21241 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
MODERN MEANS OF TRAJECTOGRAPHY [MOYENS MODERNES DE TRAJECTOGRAPHIE] c04
Alain Tert *In* AGARD Take-off and Landing Jan. 1975 15 p In FRENCH (For availability see N75-21219 13-01)

Various equipment and systems developed and utilized for take-off and landing trajectography of modern aircraft are examined. The STRADA, LIDAR, and inertial navigation systems are covered; systems are designed to measure trajectories accurately and rapidly without error. Transl. by E.H.W.

N75-21242# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT Report for 1 Jul. - 30 Sep. 1974
30 Sep. 1974 71 p refs
(AD-A002909; DME/NAE-1974 (3)) Avail: NTIS CSCL 01/2

The bulletin reviews ongoing research in the fields of hydrodynamics, fluid mechanics, aerodynamics, and structural mechanics. GRA

N75-21243# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SEMINARS: AN EFFECTIVE METHOD FOR DISSEMINATING ADVANCED EXPERIENCE
I. A. Lev 6 Dec. 1974 11 p Transl. into ENGLISH from Nauch. Tekhn. Inform. Ser. 1, Organ. i Metod. Inform. Raboty (USSR), no. 2, Sep. 1972 p 18-19
(AD-A002805; FTD-HT-23-635-75) Avail: NTIS CSCL 01/3

The translation discusses briefly the seminars at the Bykovskiy Aircraft-Maintenance Plant for the purpose of study and adaptation of the achievements made in science, technology and advanced industrial experience. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N75-21244 Mississippi State Univ., State College.
FEASIBILITY STUDY OF THE USE OF THE LK-10A GLIDER AS A POST STALL RESEARCH VEHICLE Ph.D. Thesis
Donald Thomas Ward 1974 200 p
Avail: Univ. Microfilms Order No. 75-4223

The feasibility of using a low cost sailplane for post-stall research and training is analyzed. Post-stall characteristics of the test aircraft and instrumentation requirements for post-stall research in sailplanes are identified. Post-stall operational constraints for gliders are qualitatively examined. The aircraft was modified for safety and to provide quantitative measurements of post-stall parameters. The post-stall characteristics of the aircraft were satisfactory for post-stall research and provide valuable experience for pilots training for post-stall tests. Mildly oscillatory spin modes were observed. The steep mode had an angle of attack of 35 deg, while the flatter spin mode had an angle of attack of 55 deg. Aerodynamic controls were effective for recovery from either spins or post-stall gyrations. The direct operating costs of the sailplane are an order of magnitude less than those of operational jet aircraft used to explore post-stall regime. The structural and system simplicity of the sailplane allows modifications to be made economically. The low cost, demonstrated safety, and broad spectrum of available post-stall motions suggest a significant post-stall research capability and a useful post-stall training potential for the sailplane. Dissert. Abstr.

N75-21245 Colorado Univ., Boulder.
THE STRUCTURE AND STABILITY OF A VORTEX Ph.D. Thesis
Param Indar Singh 1974 143 p
Avail: Univ. Microfilms Order No. 75-3833

The vortex generated by a laminar semi-wing was experimentally studied in a low speed wind tunnel. Hot wire anemometers were used to measure mean and fluctuating velocities across the vortex wake up to 85 chord lengths downstream. The vortex was completely rolled up at less than 10 chord lengths. The mean flow in the vortex was axisymmetric and dependent on initial conditions. At lift to drag ratio of 20, the vortex core had a small axial velocity defect which decayed like an axisymmetric wake. Experimental data were used to compute an eddy viscosity coefficient which was compared with other flight and wind tunnel experiments. At lift to drag ratio of 60 the vortex had a strong axial core jet near the wing trailing edge which decayed rapidly into a large axial velocity defect. Laminar instabilities developed and led to large scale motion of vortex core. The modes and wavelengths of the instabilities were found. Strouhal number was measured along with the Reynold's stress and dissipation. The effect of a coaxial jet on vortex decay was studied. The jet caused rapid decay of the vortex maximum swirl velocity in the near wake, but farther down stream the decay was independent of jet velocity and was governed by swirl velocity. Dissert. Abstr.

N75-21246 Texas Univ., Austin.
APPLICATION OF A GRADIENT PROJECTION TECHNIQUE TO MINIMUM-WEIGHT DESIGN OF LIFTING SURFACES WITH AEROELASTIC AND STATIC CONSTRAINTS Ph.D. Thesis
Ibrahim Onur Erbug 1974 163 p
Avail: Univ. Microfilms Order No. 75-4358

A parameter optimization algorithm is developed based on the gradient projection concept. The algorithm is applied to the aeroelastic optimization of a semi-infinite panel in supersonic flow and to the aeroelastic-stress optimization of a delta-wing in supersonic flow. The total weight is taken as the objective function. Constraints are placed on flutter speed and minimum thickness for the panel problem and on flutter speed, stress, and minimum thickness for the delta wing problem. Different finite element combinations are studied for the panel problem. Using six tapered elements across the span, the effect of damping on the optimum shape is investigated. For the delta-wing problem a 3x3 grid of triangular bending elements is used. The effect of constraints on the optimum shape is studied by optimizing the structure first using only flutter and thickness constraints, then using only stress and thickness constraints, and finally using all three sets of constraints. Total weight reductions of 47% to 63% are obtained depending on the combinations of constraints. Dissert. Abstr.

N75-21247*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLOW VISUALIZATION STUDY OF CLOSE-COUPLED CANARD WING AND STRAKE WING CONFIGURATION
Dennis D. Miner and Blair B. Gloss 3 Mar. 1975 115 p refs
(NASA-TM-X-72668) Avail: NTIS HC $5.25 CSCL 01A

The Langley 1/8-scale V/STOL model tunnel was used to qualitatively determine the flow fields associated with semi-span close coupled canard wing and strake wing models. Small helium filled bubbles were injected upstream of the models to make the flow visible. Photographs were taken over the angle-of-attack ranges of -10 deg to 40 deg. Author

N75-21248*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LONGITUDINAL AERODYNAMICS OF A LOW-WING LIFT-FAN TRANSPORT INCLUDING HOVER CHARACTERISTICS IN AND OUT OF GROUND EFFECT
Danny R. Hoad (Army Air Mobility R and D Lab., Hampton, Va.) and Garl L. Gentry, Jr. Apr. 1975 155 p refs

(NASA-TM-X-72670) Avail: NTIS HC $6.25 CSCL 01A

A wind-tunnel investigation was conducted in the Langley V/STOL tunnel to determine the longitudinal aerodynamic characteristics of a six-fan, tip-driven (remote) lift-fan VTOL transport throughout transition. The large midspan lift-fan pods and cruise fans were removed to determine their influence on the stability and control of the configuration. Data were obtained in the hovering mode for ranges of model height above ground. The data are presented without analysis or discussion. Author

N75-21249*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WIND TUNNEL INVESTIGATION OF HELICOPTER-ROTOR WAKE EFFECTS ON THREE HELICOPTER FUSELAGE MODELS

John C. Wilson and Raymond E. Mineck Washington Mar. 1975 209 p refs

(NASA-TM-X-3185; L-9454) Avail: NTIS HC $7.25 CSCL 01A

The effects of rotor wake on helicopter fuselage aerodynamic characteristics were investigated in the Langley V/STOL tunnel. Force, moment, and pressure data were obtained on three fuselage models at various combinations of windspeed, sideslip angle, and pitch angle. The data show that the influence of rotor wake on the helicopter fuselage yawing moment imposes a significant additional thrust requirement on the tail rotor of a single-rotor helicopter at high sideslip angles. Author

N75-21250*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COLD-AIR ANNULAR-CASCADE INVESTIGATION OF AERODYNAMIC PERFORMANCE OF CORE-ENGINE-COOLED TURBINE VANES. 1: SOLID-VANE PERFORMANCE AND FACILITY DESCRIPTION

Louis J. Goldman and Kerry L. McLallin Washington Apr. 1975 25 p refs

(NASA-TM-X-3224; E-8214) Avail: NTIS HC $3.25 CSCL 01A

The aerodynamic performance of a solid (uncooled) version of a core engine cooled stator vane was experimentally determined in a full-annular cascade, where three-dimensional effects could be obtained. The solid vane, which serves as a basis for comparison with subsequent cooled tests, was tested over a range of aftermixed critical velocity ratios of 0.57 to 0.90. Overall vane aftermixed efficiencies were obtained over this critical velocity ratio range and compared with results from a two-dimensional cascade. The variation in vane efficiency and aftermixed flow conditions with circumferential and radial position were obtained and compared with design values. Vane surface static-pressure distributions were also measured and compared with theoretical results. Author

N75-21251*# Lockheed Aircraft Corp., Marietta, Ga.

HIGH REYNOLDS NUMBER TEST OF A NACA 651-213, a EQUALS 0.5 AIRFOIL AT TRANSONIC SPEEDS

Kenneth P. Burdges, James A. Blackwell, Jr., and Gerald A. Pounds Washington NASA Mar. 1975 164 p refs

(Contract NAS1-12325)

(NASA-CR-2499) Avail: NTIS HC $6.25 CSCL 01A

Wind-tunnel tests were conducted in the Lockheed-Georgia Company's compressible flow facility to determine the transonic two-dimensional aerodynamic characteristics of a NACA 65 sub 1-213 a = 0.50 airfoil. The results are correlated with data obtained in the NASA-Langley 8-foot transonic pressure tunnel and the NAE high Reynolds number 15x60-inch two-dimensional test facility. The tests were conducted over a Mach number range from 0.60 to 0.80 and an angle of attack range from -1 deg to 8 deg. Reynolds numbers, based on the airfoil chord, were varied. Author

N75-21252# Rochester Applied Science Associates, Inc., N.Y.

EFFECT OF WAKE ON THE PERFORMANCE AND STABILITY CHARACTERISTICS OF ADVANCED ROTOR SYSTEMS Final Report

Keith W. Shipman Sep. 1974 164 p refs

(Contract DAAJ02-73-C-0030; DA Proj. 1F1-62204-AA-41)

(AD-A002671; RASA-74-03; USAAMRDL-TR-74-45) Avail: NTIS CSCL 01/1

The performance parameters and stability and control derivatives for various rotor systems are considered using the wake-induced velocity distributions to compute the loading and responses of the rotor blades. The geometry of a self-deformed wake is used to compute influence coefficients which, when multiplied by the blade circulation loading, provide the distribution of the wake-induced velocities. The blade's loading and response are coupled together and iterations are carried out in the blade loads and response program until the two are compatible. Interactions of the wake with the airframe are not considered, and the flight conditions are limited to steady forward flight. GRA

N75-21253# Martin Marietta Aerospace, Orlando, Fla.

AERODYNAMIC METHODOLOGY. BODIES WITH TAILS AT ARBITRARY ROLL ANGLE Final Report, Jun. - Dec. 1974

John E. Fidler and Michael C. Bateman Dec. 1974 77 p refs (Contract DAAH01-74-C-0621)

(AD-A003341; OR-3375-1) Avail: NTIS CSCL 16/4

The construction and use of empirical methods for predicting aerodynamic characteristics of body/tail missile configurations are described. Methods are applicable to the case of combined angle of attack (up to 25 degrees) and roll (up to 90 degrees). Mach number range is 0.8 - 1.2. The methods deal with the separate components of the missile and with their mutual interactions. Comparisons between predicted and experimental data show generally good agreement. GRA

N75-21225 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

TRADEOFF PARAMETERS OF ALTERNATIVE TAKEOFF AND LANDING AIDS

Kennerly H. Digges *In* AGARD Take-off and Landing Jan. 1975 18 p refs (For availability see N75-21219 13-01)

N75-21226 Royal Aircraft Establishment, Bedford (England).

A TECHNIQUE FOR ANALYSING THE LANDING MANOEUVRE

R. F. A. Keating *In* AGARD Take-off and Landing Jan. 1975 12 p refs (For availability see N75-21219 13-01)

N75-21230 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).

SOME LOW SPEED ASPECTS OF THE TWIN-ENGINE SHORT HAUL AIRCRAFT VFW 614

Hartmut Griem, Juergen Barche, Hans J. Beisenherz, and Guenther Krenz *In* AGARD Take-off and Landing Jan. 1975 19 p refs (For availability see N75-21219 13-01)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N75-21254*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

STOL TERMINAL AREA OPERATING SYSTEMS (AIRCRAFT AND ONBOARD AVIONICS, ATC, NAVIGATION AIDS)

Clifford Burrous, Heinz Erzberger, Norman Johnson, and Frank Neuman Nov. 1974 50 p refs

(NASA-TM-X-62403; A-5829) Avail: NTIS HC $3.75 CSCL 01B

Operational procedures and systems onboard the STOL aircraft which are required to enable the aircraft to perform acceptably in restricted airspace in all types of atmospheric conditions and weather are discussed. Results of simulation and flight investigations to establish operational criteria are presented. Author

N75-21255*# United Air Lines, Inc., Chicago, Ill.

OPERATIONAL FLIGHT EVALUATION OF THE TWO-SEGMENT APPROACH FOR USE IN AIRLINE SERVICE

G. K. Schwind, J. A. Morrison, W. E. Nylen, and E. B. Anderson
Washington NASA Apr. 1975 65 p refs
(Contract NAS2-7208)
(NASA-CR-2515) Avail: NTIS HC $4.25 CSCL 01B

United Airlines has developed and evaluated a two-segment noise abatement approach procedure for use on Boeing 727 aircraft in air carrier service. In a flight simulator, the two-segment approach was studied in detail and a profile and procedures were developed. Equipment adaptable to contemporary avionics and navigation systems was designed and manufactured by Collins Radio Company and was installed and evaluated in B-727-200 aircraft. The equipment, profile, and procedures were evaluated out of revenue service by pilots representing government agencies, airlines, airframe manufacturers, and professional pilot associations. A system was then placed into scheduled airline service for six months during which 555 two-segment approaches were flown at three airports by 55 airline pilots. The system was determined to be safe, easy to fly, and compatible with the airline operational environment. Author

N75-21256*# Bell Helicopter Co., Fort Worth, Tex.
CONCEPTUAL DESIGN STUDY OF 1985 COMMERCIAL TILT ROTOR TRANSPORTS. VOLUME 1: VTOL DESIGN SUMMARY Final Report
J. A. Detore and K. W. Sambell Washington NASA May 1975 115 p refs
(Contract NAS2-8259)
(NASA-CR-2544; D312-099-002-Vol-1) Avail: NTIS HC $5.25 CSCL 01C

Aircraft were synthesized in the 21-, 45-, and 100- passenger categories. Technological factors were considered and the 45-passenger point design, designated the D312, was selected. Variants of the D312 having sideline noise levels in hover of + or - 5 PNdB were also studied. All three 45-passenger aircraft were analyzed for performance, weights, economics, handling qualities, noise footprints, aeroelastic stability and ride comfort. Results are presented. Author

N75-21233 Yingling (George L.), Dayton, Ohio.
GUIDANCE PHILOSOPHY FOR MILITARY INSTRUMENT LANDING
George L. Yingling *In* AGARD Take-off and Landing Jan. 1975 13 p refs (For availability see N75-21219 13-01)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-21257 Ohio State Univ., Columbus.
CLASSIFICATION OF OBJECTS WITH COMPLEX GEOMETRIC SHAPE BY MEANS OF LOW FREQUENCY ELECTROMAGNETIC RESPONSE Ph.D. Thesis
Yau Tang Lin 1974 111 p
Avail: Univ. Microfilms Order No. 75-3125

A study of the effectiveness of low frequency electromagnetic responses for identifying objects of complex shape is presented. The linear separability of a large variety of objects such as cubes, cylinders and aircraft were examined. An efficient computational method for modeling the scattering returns from an arbitrarily shaped object was developed. This technique was used to simulate the required radar returns from aircraft without resorting time consuming and costly experimental measurements. Two classification algorithms, a linear discriminant and a nearest neighbor rule, were used to classify a set of four aircraft models. The results indicate that amplitude, phase and polarization each carries a substantial amount of target information. With the assumption of a priori knowledge of the target's approximate aspect angle, a reliable classification can be attained utilizing a rather small number of frequencies. Dissert. Abstr.

N75-21258 Ohio State Univ., Columbus.
CONTROL OF ELECTROMAGNETIC SCATTERING BY ANTENNA IMPEDANCE LOADING Ph.D. Thesis
Shi-Chuan Lee 1974 85 p
Avail: Univ. Microfilms Order No. 75-3119

The application of impedance loading techniques for the reduction of backscatter from radar targets were studied. The hybrid methods which combine the GTD and the moment method were used to analyze the backscattering from various geometries such as impedance loaded infinite wedge and a two-dimensional wing model. The effect of both the trailing and the leading edge was considered by using a two-dimensional wing model. The edge diffraction source was considerably reduced over a 3:1 frequency band for the two-dimensional case. The square plate with a loaded slot was analyzed by a wire grid model. The backscatter reduction of the square plate was achieved at least over a 2:1 frequency band. Dissert. Abstr.

N75-21259 Kansas Univ., Lawrence.
MAP-MATCHING LOCATION ESTIMATION USING A SENSOR WHICH RESOLVES IN RANGE ONLY Ph.D. Thesis
James L. Thomas 1974 149 p Sponsored by ERDA
Avail: Univ. Microfilms Order No. 75-6202

A system model is presented with which the performance of a map-matching location-estimation system (MMLES) is determined by analysis when the scene category of interest is specified as a random process. Emphasis is given to the application of this model to radar MMLES and in particular radar MMLES which resolve in range only. A simplified problem is analyzed using the system model. For the scene process considered it is seen that a scene contrast ratio of 30 db is required for acceptable performance. It is shown that for a given range resolution the best scene correlation distance is on the order of the range resolution. The effects of various system parameters are demonstrated. Results of analyses of experimental data obtained from flights which involved a radar sensor which produced an image consisting of a range-only scan of the terrain scene are included. The results establish the feasibility of an imaging sensor which resolves in range only for use in an MMLES.
Dissert. Abstr.

N75-21260# Institute for Telecommunication Sciences, Boulder, Colo.
MULTIPATH IN THE AIR TRAFFIC CONTROL FREQUENCY BANDS. VOLUME 1: CLASSIFICATION OF MULTIPATH, EFFECTS OF MULTIPATH ON SYSTEMS, AND CAUSES OF MULTIPATH
William J. Hartman, ed. Jul. 1974 300 p refs
(Contract DOT-FA72WAI-239)
(AD-A006267; FAA-RD-74-75-Vol-1) Avail: NTIS HC $8.75 CSCL 17/2

Methods for developing mathematical descriptions of multipath propagation for line-of-sight paths at frequencies above VHF are discussed for air traffic control. A simple technique is developed for determining the performance of a telecommunications system with a slow-flat fading signal. F.O.S.

N75-21261# Weapons Research Establishment, Salisbury (Australia).
FINGER LANCE: A SEMI AUTOMATIC HF DIRECTION OF ARRIVAL AND DOPPLER MEASURING SYSTEM FOR THE STUDY OF LOCAL TRAVELLING IONOSPHERIC DISTURBANCES
R. D. Spragg Mar. 1974 33 p refs
(WRE-TN-A-243(AP)) Avail: ERDA Depository Libraries HC $4.75

Travelling ionospheric disturbances are responsible for significant errors in high-frequency direction finding, especially at short ranges. Research in this area is concentrated on determining the magnitude, velocity, and spatial correlation of these disturbances with a view to improving the accuracy of high-frequency direction finding. In support of the research program a semi-automatic high frequency direction of arrival measuring system was developed. This system automatically measures the direction of arrival, associated Doppler shifts, and apparent path length of up to four transmissions propagated via the ionosphere. Author (NSA)

N75-21262# California Univ., Livermore. Lawrence Livermore Lab.
INSTRUMENTING THE LAPQ-1 AIRBORNE CLOUD-MAPPING RADAR FOR UTILIZATION ON OPERATION DIAL TRAIN
W. K. Mortensen and E. D. Border Jun. 1972 36 p Sponsored by ERDA
(UCID-16065) Avail: NTIS HC $3.75

The implementation of the LAPQ-1 radar system on operation Dial Train for the purpose of collecting radar cross-section data on certain radar targets is described. The special instrumentation required, the modifications to the radar required, and the problems encountered in preparing to operate the radar aboard ship are discussed. NSA

N75-21263# Battelle Columbus Labs., Ohio.
IMU SELF-ALIGNMENT TECHNIQUES
J. C. Hung and H. V. White 30 Sep. 1974 65 p refs
(Contract DAHC04-72-A-0001; DA Proj. 1M2-63306-D-007) (AD-A002696; RG-75-15) Avail: NTIS CSCL 17/7

This report presents the results of a study on platform self-alignment performed at the Guidance and Control Directorate, US Army Missile Research, Development and Engineering Laboratory, Redstone Arsenal, Alabama. The study was initiated to explore the latest techniques in platform self-alignment and to develop new and novel approaches which would enhance the successful application of self-alignment principles to the PERSHING 2 platform alignment problem with its unique accuracy and reaction time constraints. A significant result of this study is the development of a new gyrocompassing algorithm which provides improved self-alignment performance. GRA

N75-21264# Transportation Systems Center, Cambridge, Mass.
ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM STUDY, EXECUTIVE SUMMARY Final Report, 1 Jul. 1973 - 30 Jun. 1974
Jan. 1975 17 p refs
(PB-238779/3; DOT-TSC-OST-75-1) Avail: NTIS HC $3.25 CSCL 17G

The U.S. Department of Transportation study and development plans for the air traffic management system of the late 1980's and beyond are summarized. The plans are presented in the framework of an evolutionary system concept of traffic management, building upon the Upgraded Third Generation Air Traffic Control System, and defined to meet the projected demands for service, safety, and flexibility in a cost effective manner. In order to provide the information needed for planning future system developments, a program of research and development is described for the system concept presented. GRA

N75-21241 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
MODERN MEANS OF TRAJECTOGRAPHY [MOYENS MODERNES DE TRAJECTOGRAPHIE]
Alain Tert *In* AGARD Take-off and Landing Jan. 1975 15 p In FRENCH (For availability see N75-21219 13-01)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-21265 Washington Univ., Seattle.
A NON-GAUSSIAN MODEL OF CONTINUOUS ATMOSPHERIC TURBULENCE FOR USE IN AIRCRAFT DESIGN Ph.D. Thesis
Paul Miller Reeves 1974 256 p
Avail: Univ. Microfilms Order No. 75-4040

The research is restricted to the modeling of regions of the atmosphere within which the disturbance to the aircraft is steady or continuous, and the assumptions of homogeneity and stationarity are justified. In order to simplify the discussion, the problem is further restricted to cases in which the distribution of gusts over the surface of the aircraft can be neglected. Thus the turbulence model discussed in this report consists of three independent, stationary stochastic processes which represent the vertical, lateral, and longitudinal gust components encountered by the aircraft as it moves through the gust field. The Gaussian model now in wide use is reviewed. A comparison of this model with experimental data shows that it underestimates the number of high velocity gusts which occur in the atmosphere.
Dissert. Abstr.

N75-21266 Virginia Univ., Charlottesville.
COMPUTER AIDED DESIGN OF AIRCRAFT STRUCTURES Ph.D. Thesis
Gary Lee Giles 1974 308 p
Avail: Univ. Microfilms Order No. 75-4682

Procedures developed for automated design of aircraft structures are presented in three stages: description and identification of key aspects of the overall structural design process; descriptions of analytical design procedures developed to perform specific steps; and numerical results from two design systems, one for early preliminary design and another for later stages of preliminary design. The automated procedures are used to make design studies of a Mach 3 transport wing. The usefulness of the routines for automatic generation of analytical models and routines for graphic output of design information is illustrated. Design calculations are made using crude and refined structural models to assess the effects of different levels of modeling on numerical results and computational time. It is concluded that for an efficient design system procedures should be tailored to a particular phase of the design process and corresponding level of modeling, with the essential capability for transfer of data between levels included. Dissert. Abstr.

N75-21267*# Arde, Inc., Mahwah, N.J.
FABRICATION AND TESTING OF PRESTRESSED COMPOSITE ROTOR BLADE SPAR SPECIMENS Final Report
David Gleich Oct. 1974 113 p refs
(Contract NAS1-11594)
(NASA-CR-132611; ARDE-J/N-41004) Avail: NTIS HC $5.25 CSCL 01C

Prestressed composite spar specimens were fabricated and evaluated by crack propagation and ballistic penetration tests. The crack propagation tests on flawed specimens showed that the prestressed composite spar construction significantly suppresses crack growth. Damage from three high velocity 30 caliber projectile hits was confined to three small holes in the ballistic test specimen. No fragmentation or crack propagation was observed indicating good ballistic damage resistance. Rotor attachment approaches and improved structural performance configurations were identified. Design theory was verified by tests. The prestressed composite spar configuration consisted of a compressively prestressed high strength ARDEFORM 301 stainless steel liner overwrapped with pretensioned S-994 fiberglass. Author

N75-21268*# Lockheed-California Co., Burbank.
ADVANCED SUPERSONIC TECHNOLOGY CONCEPT STUDY: HYDROGEN FUELED CONFIGURATION, SUMMARY REPORT
G. D. Brewer and R. E. Morris Washington NASA Apr. 1975 53 p refs
(Contract NAS2-7732)
(NASA-CR-2534; LR-26322) Avail: NTIS HC $4.25 CSCL 01C

Conceptual designs of hydrogen fueled supersonic transport configurations for the 1990 time period were developed and compared with equivalent technology Jet A-1 fueled vehicles to determine the economic and performance potential of liquid hydrogen as an alternate fuel. Parametric evaluations of supersonic cruise vehicles with varying design and transport mission characteristics established the basis for selecting a preferred configuration. An assessment was made of the general viability of the selected concept including an evaluation of costs and environmental considerations, i.e., exhaust emissions and sonic boom characteristics. Technology development requirements and suggested implementation schedules are presented. Author

N75-21269*# United Air Lines, Inc., Denver, Colo.
ENGINEERING FLIGHT AND GUEST PILOT EVALUATION REPORT, PHASE 2

John A. Morrison, Erik B. Anderson, Gordon W. Brown, and George K. Schwind 15 Nov. 1974 143 p
(Contract NAS2-7475)
(NASA-CR-137664) Avail: NTIS HC $5.75 CSCL 01C

Prior to the flight evaluation, the two-segment profile capabilities of the DC-8-61 were evaluated and flight procedures were developed in a flight simulator at the UA Flight Training Center in Denver, Colorado. The flight evaluation reported was conducted to determine the validity of the simulation results, further develop the procedures and use of the area navigation system in the terminal area, certify the system for line operation, and obtain evaluations of the system and procedures by a number of pilots from the industry. The full area navigation capabilities of the special equipment installed were developed to provide terminal area guidance for two-segment approaches. The objectives of this evaluation were: (1) perform an engineering flight evaluation sufficient to certify the two-segment system for the six-month in-service evaluation; (2) evaluate the suitability of a modified RNAV system for flying two-segment approaches; and (3) provide evaluation of the two-segment approach by management and line pilots. Author

N75-21270*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DYNAMIC-STABILITY TESTS ON AN AIRCRAFT ESCAPE MODULE AT MACH NUMBERS FROM 0.40 TO 2.16 Final Report
Edwin E. Davenport and Robert A. Kilgore 16 Apr. 1975 58 p refs
(NASA-TM-X-72680) Avail: NTIS HC $4.25 CSCL 01C

Wind-tunnel measurements of the aerodynamic damping and oscillatory stability of a model of a proposed escape module for a military aircraft have been made using a small-amplitude forced-oscillation technique in pitch and yaw at Mach numbers from 0.40 to 2.16 and in roll at Mach numbers from 0.40 to 1.20. The results in pitch indicate regions in the angle-of-attack range where the model exhibits large and rapid changes in both damping and stability with angle of attack, probably caused by vortex flow over the fins. There was no pronounced effect of change in angle of attack on damping in yaw. Except for the highest Mach number, negative damping in roll was produced at high negative angles of attack. Author

N75-21271# National Aeronautical Establishment, Ottawa (Ontario).
CORRELATION OF FATIGUE DATA FOR ALUMINUM AIRCRAFT WING AND TAIL STRUCTURES
R. Hangartner Dec. 1974 48 p refs
(NRC-14555; LR-582; ISSN-0077-5541) Avail: NTIS HC $3.75

S-N curves are derived for aluminum wing and tail structures by fitting various regression models to 246 full scale constant amplitude fatigue test results from twelve types of aircraft structures. The derived curves were tested by comparing the predicted lives with actual test results of various aircraft structures fatigue tested to variable-amplitude loads spectra. More reliabie predictions resulted from these derived S-N curves than from existing S-N curves. Author

N75-21272# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
TAIL ROTOR SHAFT VIBRATION SURVEY PRODUCTION UH-1H HELICOPTER Final Report, 19 Mar. - 4 Apr. 1974
Emmett J. Laing, Michael A. Hawley, and Arnold E. Weand, Jr. Jul. 1974 70 p refs
(AD-A002574; USAAEFA-73-10) Avail: NTIS CSCL 01/3

Tail rotor shaft vibration measurement tests were conducted on a production UH-1H helicopter to define tail rotor shaft vibration characteristics during ground runs. Testing was performed by the United States Army Aviation Engineering Flight Activity at Edwards Air Force Base, California, between 19 March and 4 April 1974. The testing consisted of 11 ground runs totaling one productive test hour. Vibration data were recorded from 7 accelerometer locations for 11 tail rotor shaft configurations, and narrow band spectral analyses were performed on the vibration data. GRA

N75-21273# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
INVESTIGATION OF UPPER SURFACE BLOWING APPLIED TO HIGH SPEED AIRCRAFT Final Technical Report, 1 May 1973 - 2 May 1974
Kichio K. Ishmitsu 2 Jul. 1974 247 p refs
(Contract F33615-73-C-3137; AF Proj. 1207)
(AD-A003325; AFFDL-TR-74-89) Avail: NTIS CSCL 01/3

A preliminary evaluation of transonic, propulsive, life augmentation system known as upper surface blowing USB has been completed. USB is a thick jet, jet flap powered lift concept which uses a trailing edge flap and the coanda effect to vector the jet engine exhaust for lift augmentation. A wind tunnel test has demonstrated lift induction increments 11/2 to 3 times the thrust vectored component in the lift direction. An estimate of a USB fighter performance shows a possible 40 knot reduction in approach speed and a 10% reduction in trun radius for a maximum sustained G turn at mach 0.90 and 30,000 feet altitude. GRA

N75-21274# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
A COMPUTER STUDY OF ACCELERATION DEVELOPED BY A VERTICAL SEEKING EJECTION SEAT
E. Fessenden, G. Hildebrand, and R. J. Crosbie 18 Nov. 1974 36 p refs
(F41451402)
(AD-A002970; NADC-74229-40) Avail: NTIS CSCL 01/3

With the advent of the V/STOL aircraft and its application in the attack role, it has become obvious that a traditional ejection seat will not fulfill all the escape requirements peculiar to this type of aircraft. In an effort to overcome this difficulty, the concept of vertical seeking is offered. The basic philosophy here is to rotate the seat/man configuration into a vertical position as soon as the cockpit is cleared and then thrust it upward in a stabilized trajectory to an altitude that will permit safe recovery. The effort to date has been a limited parametric computer study aimed at obtaining baseline design data investigations into the physiological stress that will be imposed on the crewman. The main topic of the paper is the discussion of acceleration and load definition and then the influence of various operational parameters on them. GRA

N75-21275# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
JOINT GENERALIZED LEAST SQUARES APPLIED TO COST ESTIMATION FOR FIGHTER AIRCRAFT M.S. Thesis
Patrick W. OBrien Dec. 1974 103 p refs
(AD-A003354; GSA/SM/74D-7) Avail: NTIS CSCL 01/3

Joint Generalized Least Squares is an extension of least squares techniques which decreases statistical uncertainty in derived regression equations. The technique is applied to historical costs for airframes, avionics, and engines in fighter aircraft. A comparison is made of parametric cost estimating relationships derived using ordinary and Joint Generalized Least Squares to demonstrate reductions in statistical uncertainty. GRA

N75-21276# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PROCEEDINGS OF AFCRL 8TH SCIENTIFIC BALLOON SYMPOSIUM
Andrew S. Carten, Jr., ed. 21 Aug. 1974 579 p refs Symp. held at Hyannis, Mass., 30 Sep. - 3 Oct. 1974
(AF Proj. 62101F)
(AD-A003398; AFCRL-SR-182; AFCRL-TR-74-0393) Avail: NTIS CSCL 01/3

This publication contains preprints of papers presented at the Eighth AFCRL Scientific Balloon Symposium, 30 September to 3 October 1974, held at Hyannis, Mass. The papers are grouped in accordance with the five symposium sessions: Powered balloons; tethered balloons; free balloon technology; balloon-borne experiments; and special applications. GRA

N75-21220* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH-LIFT AERODYNAMICS: TRENDS, TRADES, AND OPTIONS
Richard J. Margason and Harry L. Morgan, Jr. *In* AGARD Take-off

and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

N75-21221* Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
COMPATIBILITY OF TAKE-OFF AND LANDING WITH MISSION AND MANOEUVRE PERFORMANCE REQUIREMENTS FOR FIGHTER AIRCRAFT
Dieter Reich and Josef Wimbauer *In* AGARD Take-off and Landing Jan. 1975 7 p refs (For availability see N75-21219 13-01)

N75-21222 Aerospatiale Usines de Toulouse (France).
GENERAL CRITERIA FOR THE DEFINITION OF TAKE-OFF AND LANDING OF AN AIRCRAFT WITH NONLIMITED LIFT [CRITERES GENERAUX POUR LA DEFINITION AU DECOLLAGE ET A L'ATTERRISSAGE D'UN AVION NON LIMITE EN PORTANCE]
C. Pelagatti and T. Markham (British Aircraft Corp., Bristol, England) *In* AGARD Take-off and Landing Jan. 1975 11 p In FRENCH (For availability see N75-21219 13-01)

N75-21223* Boeing Commercial Airplane Co., Seattle, Wash.
TERMINAL AREA CONSIDERATIONS FOR AN ADVANCED CTOL TRANSPORT AIRCRAFT
Mark B. Sussman *In* AGARD Take-off and Landing Jan. 1975 14 p refs (For availability see N75-21219 13-01) (Contract NAS1-12018)

N75-21224 Service Technique de l'Aeronautique, Paris (France).
BRAKING PERFORMANCES
Georges Leblanc *In* AGARD Take-off and Landing Jan. 1975 17 p In FRENCH; ENGLISH summary (For availability see N75-21219 13-01)

N75-21238 Ministry of Transport, Ottawa (Ontario).
SOME DHC-6 TWIN OTTER APPROACH AND LANDING EXPERIENCE IN A STOL SYSTEM
Richard P. Bentham *In* AGARD Take-off and Landing Jan. 1975 11 p (For availability see N75-21219 13-01)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-21277# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COST ESTIMATING RELATIONSHIPS FOR PROCUREMENT COSTS OF AIRBORNE DIGITAL COMPUTERS AND INERTIAL MEASUREMENT UNITS FOR USE IN REMOTELY PILOTED VEHICLES M.S. Thesis
Kenneth V. Funkhouser Dec. 1974 82 p refs
(AD-A003353; GSA/SM/74D-3) Avail: NTIS CSCL 01/3

Parametric cost estimating relationships (CER's) are developed to predict procurement costs of airborne digital computers and inertial measurement units which are suitable for use in remotely piloted vehicles (RPV's). The CER's predict first unit recurring cost in 1974 dollars and can be incorporated with an appropriate learning curve to estimate average cost for a given production quantity. A brief discussion of a computerized parametric cost estimation technique, the RCA PRICE model, is provided to compare methodology, input requirements, and output. The predictive capabilities of the RPV CER's are compared to avionics procurement CER's developed by the Air Force Avionics Laboratory. The RPV CER's are generally more accurate than the AFAL CER's when procurement costs of equipment usable in remotely piloted vehicles are being estimated. GRA

N75-21235 National Aerospace Lab., Amsterdam (Netherlands).
FLIGHT TESTS WITH A SIMPLE HEAD-UP DISPLAY USED AS A VISUAL APPROACH AID
G. L. Lamers *In* AGARD Take-off and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

N75-21236 Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
ALL-WEATHER LANDING SYSTEM FOR MERCURY [LE SYSTEME D'ATTERRISSAGE TOUS TEMPS DU MERCURE]
Armand Pile *In* AGARD Take-off and Landing Jan. 1975 11 p In FRENCH (For availability see N75-21219 13-01)

N75-21237 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REQUIRED PILOT CUES AND DISPLAYS FOR TAKEOFF AND LANDING
Jean-Claude Wanner *In* AGARD Take-off and Landing Jan. 1975 14 p In FRENCH; ENGLISH summary (For availability see N75-21219 13-01)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-21278*# Pratt and Whitney Aircraft, East Hartford, Conn.
TWO-STAGE FAN. 3: DATA AND PERFORMANCE WITH ROTOR TIP CASING TREATMENT, UNIFORM AND DISTORTED INLET FLOWS
G. D. Burger, T. R. Hodges, and M. J. Keenan Mar. 1975 187 p refs
(Contract NAS3-13494)
(NASA-CR-134722; PWA-5239) Avail: NTIS HC $7.00 CSCL 21E

A two stage fan with a 1st-stage rotor design tip speed of 1450 ft/sec, a design pressure ratio of 2.8, and corrected flow of 184.2 lbm/sec was tested with axial skewed slots in the casings over the tips of both rotors. The variable stagger stators were set in the nominal positions. Casing treatment improved stall margin by nine percentage points at 70 percent speed but decreased stall margin, efficiency, and flow by small amounts at design speed. Treatment improved first stage performance at low speed only and decreased second stage performance at all operating conditions. Casing treatment did not affect the stall line with tip radially distorted flow but improved stall margin with circumferentially distorted flow. Casing treatment increased the attenuation for both types of inlet flow distortion. Author

N75-21279*# Boeing Commercial Airplane Co., Seattle, Wash.
TITANIUM HONEYCOMB ACOUSTIC LINING STRUCTURAL AND THERMAL TEST REPORT Technical Report, Jan. - Aug. 1974
Donald Joynes and Jan P. Balut Dec. 1974 77 p refs
(Contract NAS3-17842)
(NASA-CR-134783; D6-42352) Avail: NTIS HC $4.75 CSCL 20A

The results are presented of static, fatigue and thermal testing of titanium honeycomb acoustic panels representing the acoustic tailpipe for the Pratt and Whitney Aircraft JT8D Refan engine which is being studied for use on the Boeing 727-200 airplane. Test specimens represented the engine and tailpipe flange joints, the rail to which the thrust reverser is attached and shear specimens of the tailpipe honeycomb. Specimens were made in four different batches with variations in configuration, materials and processes in each. Static strength of all test specimens exceeded the design ultimate load requirements. Fatigue test results confirmed that aluminum brazed titanium, as used in the Refan tailpipe design, meets the fatigue durability objectives. Quality of welding was found to be critical to life, with substandard welding failing prematurely, whereas welding within the process specification exceeded the panel skin life. Initial fatigue testing used short grip length bolts which failed prematurely. These were replaced with longer bolts and subsequent testing demonstrated the required life. Thermal tests indicate that perforated

skin acoustic honeycomb has approximately twice the heat transfer of solid skin honeycomb. Author

N75-21280*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF GROUND REFLECTION OF JET NOISE OBTAINED WITH VARIOUS MICROPHONE ARRAYS OVER AN ASPHALT SURFACE
J. H. Miles 1975 44 p refs Presented at the 89th Meeting of the Acoust. Soc. of Am., Austin, Tex., 8-11 Apr. 1975
(NASA-TM-X-71696; E-8299) Avail: NTIS HC $3.75 CSCL 2A

Ground reflection effects on the propagation of jet noise over an asphalt surface are discussed for data obtained using a 33.02-cm diameter nozzle with microphones at several heights and distances from the nozzle axis. Ground reflection effects are analyzed using the concept of a reflected signal transfer function which represents the influence of both the reflecting surface and the atmosphere on the propagation of the reflected signal in a mathematical model. The mathematical model used as a basis for the computer program was successful in significantly reducing the ground reflection effects. The range of values of the single complex number used to define the reflected signal transfer function was larger than expected when determined only by the asphalt surface. This may indicate that the atmosphere is affecting the propagation of the reflected signal more than the asphalt surface. The selective placement of the reinforcements and cancellations in the design of an experiment to minimize ground reflection effects is also discussed. Author

N75-21281# Tennessee Univ. Space Inst., Tullahoma.
SOME RESULTS OF AEROACOUSTIC RESEARCH
B. H. Goethert [1974] 13 p refs
Avail: NTIS HC $3.25

Fundamental and applied research in the field of exhaust jet noise, emphasizing the special noise producing characteristics of unconventional exhaust nozzles as multi-circular, slot, and those with noise flap shields are reported. Studies were initiated on exhaust jets, which mix with secondary air underneath a shroud. The guiding idea of such configurations is to have the region of high turbulence and thus also of intense noise shielded from the outside, and have the exhaust jet discharged into the atmosphere at greatly reduced velocities. At such reduced velocities, the externally generated noise is greatly reduced, and in conjunction with the internal shielding of the primary jet, a significant reduction of the total exhaust noise can be expected. Author

N75-21282*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLIGHT INVESTIGATION OF INSTALLATION EFFECTS ON A WEDGE NOZZLE INSTALLED ON AN UNDERWING NACELLE
Albert L. Johns Washington Apr. 1975 40 p refs
(NASA-TM-X-3207; E-8100) Avail: NTIS HC $3.75 CSCL 21E

A flight research program was conducted using a modified F-106B aircraft with an underwing-nacelle - engine installation to investigate installation effects on a wedge nozzle with retracted shrouds from Mach 0.70 to 1.10. These configurations simulated the subsonic flight geometries of a variable-geometry wedge nozzle design for Mach 2.70 operation. The nozzle was tested with a J85-GE-13 turbojet engine, and data were compared with that of 0.34-scale isolated wind tunnel model. Data are also compared with the flight results of a boattail plug nozzle and a cylindrical nacelle plug nozzle. A favorable installation effect occurred from Mach 0.82 to 0.96 with a nominal 4-percent corrected secondary weight-flow ratio. This favorable effect resulted from changes in pressure forces on the nozzle surfaces. The wedge nozzle gross thrust coefficient was about the same as the boattail nacelle plug nozzle and 2.50 to 1.30 percent higher than the cylindrical nacelle plug nozzle over the subsonic Mach number range. Author

N75-21283*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF CASING TREATMENT ON PERFORMANCE OF A MULTISTAGE COMPRESSOR
Leon M. Wenzel, John E. Moss, Jr., and Charles M. Mehalic Washington Jan. 1975 31 p refs
(NASA-TM-X-3175; E-8085) Avail: NTIS HC $3.75 CSCL 21E

AJ85-GE-13 engine was equipped with a compressor case which allowed changes to the case wall over the rotor tips of six of its stages. The engine was tested with four inlet configurations: undistorted and with 180 deg circumferential, hub radial, and tip radial distortions. Baseline data defining compressore performance and stall regions were taken for these inlet configurations with solid (untreated) compressor case inserts. Circumferentially grooved inserts were installed in the first three and last three stages, and the compressor was mapped under similar conditions. The compressor was mapped a third time with untreated inserts in the first three stages and inserts having slots conforming to blade angles in the last three stages. In most cases, the stall pressure ratio was the same as or lower than the baseline. Pumping capacity with the slotted inserts was reduced. Overall compressor efficiency with the grooved rings installed did not appreciably differ from the baseline, but it was 1 to 2 percentage points lower than the baseline with the slotted rings in place. Average stage characteristics for the undistorted inlet case showed little or no sensitivity to casing treatment. Author

N75-21284# Oak Ridge Gaseous Diffusion Plant, Tenn.
EXPERIMENTAL DETERMINATION OF THE LOSS COEFFICIENT IN AN ANNULAR DIFFUSER M.S. Thesis - Tenn. Univ., Knoxville
T. A. Angelelli 16 Dec. 1974 80 p refs
(Contract W-7405-eng-26)
(K-1868) Avail: NTIS HC $4.75

This investigation was undertaken to determine the relationship between the loss coefficient and other annular diffuser performance parameters, such as inlet boundary layer blockage, nondimensional length, and inlet Mach and Reynolds numbers. Also, the static pressure recovery as it relates to these parameters was studied. The annular diffuser configuration tested consisted of a zero angle, circular cylinder outer wall and a tapering cone centerbody. Diffusers with an area ratio of 2.79 and nondimensional lengths of 12 and 15 were tested at blockage levels varying from 4 to 9% over an inlet Mach number range of 0.24 to 0.46. In addition, the sharp inlet taper of the centerbody for the diffuser with nondimensional length of 12 was rounded to a more gradual taper and tested. Results indicate that varying the nondimensional length significantly altered the loss coefficient. Author (NSA)

N75-21285# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MUFFLING THE NOISE OF POWER PLANTS WHICH USE GAS-TURBINE AIRCRAFT ENGINES
I. P. Stepanov, A. N. Uspenskii, and S. N. Uvarov 18 Nov. 1975 14 p refs Transl. into ENGLISH from Prom. Energ. (Moscow), no. 11, Nov. 1971 p 52-54
(AD-A002830; FTD-HT-23-0035-75) Avail: NTIS CSCL 21/5

This article describes the results of measurements of the noise level of a gas-turbine generator (GTU) with an output power of 20 kW and of the attempts to construct an exhaust noise muffler for it. GRA

N75-21286# Fiber Science, Inc., Gardena, Calif.
TUBULAR COMPOSITE HLH ROTOR BLADE SECTION Final Report, Nov. 1972 - Dec. 1973
Sam Yao and Dale Abildskov Nov. 1974 69 p
(Contract DAAJ02-73-C-0025; DA Proj. 1X2-63203-D-156)
(AD-A003330; USAAMRDL-TR-74-95) Avail: NTIS CSCL 01/3

This report describes the results of a research and development program to design, analyze, and fabricate a 16-foot-long section, including the root end attachment, of an HLH size rotor blade. The design of the blade section was based upon the tubular-reinforced-composite wet-filament-wound concept. GRA

N75-21287# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVICE FOR SIMULATING THE FUEL-CONTROL APPARATUS OF AN AIRCRAFT ENGINE

F. A. Korotkov and A. N. Dobrynin 25 Nov. 1974 9 p Transl. into ENGLISH from Russian Patent no. 305488 (4 Jun. 1971) 2 p
(AD-A002819; FTD-HT-23-242-75) Avail: NTIS CSCL 21/5
This invention involves the designing of electrosimulation benches intended for testing the controls of turboreactive engines, for example, basic contour controls. GRA

N75-21288# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BYPASS TURBOJET ENGINE NOISE CHARACTERISTICS ON THE TEST STAND
V. G. Eenenkov 20 Nov. 1974 36 p refs Transl. into ENGLISH from Rizhskii inst. Inzh. Grazdanskoi Aviats. Tr. (USSR), no. 174, 1971 p 3-4, 100-134
(AD-A003086; FTD-HC-23-862-74) Avail: NTIS CSCL 21/5
The report examines the acoustic characteristics of the primary noise sources of BTJE operating on the test stand. The acoustic characteristic concepts are discussed and methods for computational determination of these characteristics are given. Information is presented on the noise excitation mechanisms. The data of experimental studies of the noise of BTJE with bypass ratio y = 0 -- 6 are analyzed. GRA

N75-21240 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
STEEP APPROACH FLIGHT TEST RESULTS OF A BUSINESS-TYPE AIRCRAFT WITH DIRECT LIFT CONTROL
P. G. Hamel, K. K. Wilhelm, D. H. Hanke, and H. H. Lange *In* AGARD Take-off and Landing Jan. 1975 19 p refs (For availability see N75-21219 13-01)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-21289*# Boeing Commercial Airplane Co., Seattle, Wash.
REDUNDANT ACTUATOR DEVELOPMENT PROGRAM Final Report
C. C. Chenoweth, D. M. Fain, and C. I. Svensson Apr. 1975 170 p
(Contract NAS2-7966)
(NASA-CR-137656; D6-46457) Avail: NTIS HC $6.25 CSCL 01C
Two concepts of redundant secondary actuator mechanization, applicable to future advanced flight control systems, were studied to quantitatively assess their design applicability to an AST. The two actuator concepts, a four-channel, force summed system and a three-channel, active/standby system have been developed and evaluated through analysis, analog computer simulation, and piloted motion simulation. The quantitative comparison of the two concepts indicates that the force summed concept better meet performance requirements, although the active/standby is superior in other respects. Both concepts are viable candidates for advanced control application dependent on the specific performance requirements. Author

N75-21290# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CRITERIA OF THE LONGITUDINAL STABILITY OF THE EKRANOPLAN
R. D. Irodov 20 Nov. 1974 20 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 4, 1970 p 63-72
(AD-A002918; FTD-MT-24-2792-74) Avail: NTIS CSCL 01/3
Some questions are examined of the longitudinal stability of the ekranoplan (This term is a transliteration from the Russian and not listed in dictionaries; it is believed to be some kind of air-cushion vehicle which moves over the surface on an air cushion.) directly connected with the selection of its aerodynamic design. GRA

N75-21227* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STABILITY AND CONTROL HARMONY IN APPROACH AND LANDING
Seth B. Anderson *In* AGARD Take-off and Landing Jan. 1975 8 p refs (For availability see N75-21219 13-01)

N75-21228 National Aeronautical Establishment, Ottawa (Ontario).
THE INFLUENCE OF STOL LONGITUDINAL HANDLING QUALITIES OF PILOTS' OPINIONS
K-H. Doetsch, Jr. *In* AGARD Take-off and Landing Jan. 1975 17 p refs (For availability see N75-21219 13-01)
(Contract F33615-71-C-1722)

N75-21229 Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
LOW-SPEED STABILITY AND CONTROL CHARACTERISTICS OF TRANSPORT AIRCRAFT WITH PARTICULAR REFERENCE TO TAILPLANE DESIGN
E. Obert *In* AGARD Take-off and Landing Jan. 1975 16 p (For availability see N75-21219 13-01)

N75-21231 British Aircraft Corp., Weybridge (England). Commercial Aircraft Div.
DIRECT LIFT CONTROL APPLICATIONS TO TRANSPORT AIRCRAFT: A UK VIEWPOINT
M. R. Smith *In* AGARD Take-off and Landing Jan. 1975 10 p refs (For availability see N75-21219 13-01)

N75-21232 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
INVESTIGATIONS ON DIRECT FORCE CONTROL FOR CCV AIRCRAFT DURING APPROACH AND LANDING
Wolfgang J. Kubbat *In* AGARD Take-off and Landing Jan. 1975 11 p (For availability see N75-21219 13-01)

N75-21239 Air Force Flight Test Center, Edwards AFB, Calif.
LOW POWER APPROACH
B. Lyle Schofield *In* AGARD Take-off and Landing Jan. 1975 11 p refs (For availability see N75-21219 13-01)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-21291*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES RELATIVE TO AN INDUCTION PRESSURIZED TRANSONIC WIND TUNNEL. A: AIR PUMP PERFORMANCE; CIRCUIT LOSSES
C. Quemard, A. Mignosi, and A. Seraudie Washington NASA Mar. 1975 33 p refs Transl. into ENGLISH of the book "Etudes relatives a une soufflerie transsonique pressurisee a induction. A: Performances des trompes; pertes du circuit" Toulouse, ONERA, Jul. 1974 28 p
(Contract NASw-2481)
(NASA-TT-F-16187) Avail: NTIS HC $3.75 CSCL 14B
The performance tests are summarized of a prototype transonic induction wind tunnel. It is shown that there are advantages in using an air jet pump incorporating guide vanes at the first elbow of the wind tunnel with injection at M sub j = 1.6 at the trailing edge. The solutions for removing the drive fluid are presented. Author

N75-21292# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PRESTRESSED CONCRETE PAVEMENTS. VOLUME 2: DESIGN AND CONSTRUCTION PROCEDURES FOR CIVIL AIRPORTS Final Report
Eugene C. Odom and Paul F. Carlton Nov. 1974 78 p refs

(Contract DOT-FA71WAI-218)
(AD-A003477; FAA-RD-74-34-Vol-2) Avail: NTIS HC $4.75 CSCL 01/5

Practices and procedures for design and construction of prestressed concrete pavements are recommended for civil airports. The basic load-stress relationships were developed from small-scale model tests employing static loadings. Stresses computed from Westergaard's theory for elastic behavior were adjusted by moment correction factors to reflect the redistribution of moments resulting from partial hinges that develop under the load. Effects of repetitive moving loads were examined. The design procedure permits interrelating magnitude of loading, load repetitions, flexural strength, subgrade conditions, pavement thicknesses, slab dimensions, and magnitude of prestress. The effects of elastic shortening, creep, and shrinkage of concrete, relaxation in steel tendons, anchorage systems, tendon friction, subgrade restraint, and temperature changes are also considered. Construction procedures and alternatives are examined based on a study of prototype test pavements and operational prestressed facilities. Recommendations are based on assessments of the relative merits of prestressing with and without tendons, pretensioning versus posttensioning, types of stressing tendons and conduits, bonded versus nonbonded tendons, expansion joints and joint seals, and subgrade friction-reducing layers.
Author

N75-21293# Saphier, Lerner, Schindler, Environetics, Inc., New York.
NEW YORK OFFSHORE AIRPORT FEASIBILITY STUDY. VOLUME 3: AIRPORT CONFIGURATION, ANCILLARY FUNCTIONS, AIRPORT CONSTRUCTION, ENVIRONMENT PROTECTION, FINANCIAL ANALYSIS AND COMMUNITY IMPACT Final Report
Dec. 1974 393 p 3 Vol.
(Contract DOT-FA71WA-2626)
(AD-A003798; FAA-RD-74-184-Vol-3) Avail: NTIS HC $10.25 CSCL 01/5

The feasibility of establishing an offshore airport to serve New York City was investigated. The configuration of the terminal system and gates is described along with some of the engineering data for providing power and other utility services for the airport. The feasibility methodology of constructing the proposed offshore airport and its component parts is discussed and the capital costs of such construction are analyzed. Construction techniques are compared and a timetable for carrying out the project is proposed with emphasis on the hybrid structural concept. Major ecological factors were reviewed and their impact on the feasibility of the proposed offshore airport analyzed. The principal airport features influencing the financing of the airport are identified in a detailed financial analysis. Various aspects of the airport as they affect the community's economy, legal status, recreation, ecology, and health are discussed. For Vol. 1, see N75-18256; for Vol. 2, see N75-18257. J.M.S.

N75-21294*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF ROD GAP SPACING ON A SUCTION PANEL FOR LAMINAR FLOW AND NOISE CONTROL IN SUPERSONIC WIND TUNNELS M.S. Thesis - Old Dominion Univ.
William D. Harvey May 1975 69 p refs
(NASA-TM-X-68718) Avail: NTIS HC $4.75 CSCL 14B

Results are presented of a coordinated experimental and theoretical study of a sound shield concept which aims to provide a means of noise reduction in the test section of supersonic wind tunnels at high Reynolds numbers. The model used consists of a planar array of circular rods aligned with the flow, with adjustable gaps between them for boundary layer removal by suction, i.e., laminar flow control. One of the basic requirements of the present sound shield concept is to achieve sonic cross flow through the gaps in order to prevent lee-side flow disturbances from penetrating back into the shielded region. Tests were conducted at Mach 6 over a local unit Reynolds number range from about 1.2 x 10 to the 6th power to 13.5 x 10 to the 6th power per foot. Measurements of heat transfer, static pressure, and sound levels were made to establish the transition characteristics of the boundary layer on the rod array and the sound shielding effectiveness. Author

N75-21295* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SAN FRANCISCO FLOATING STOLPORT STUDY
28 Feb. 1974 89 p refs Prepared in cooperation with FAA Washington, D. C. and Greater San Francisco Chamber of Commerce Original contains color illustrations
(NASA-TM-X-72432) Avail: NTIS HC $4.75 CSCL 01E

The operational, economic, environmental, social and engineering feasibility of utilizing deactivated maritime vessels as a waterfront quiet short takeoff and landing facility to be located near the central business district of San Francisco was investigated. Criteria were developed to evaluate each site, and minimum standards were established for each criterion. Predicted conditions at the two sites were compared to the requirements for each of the 11 criteria as a means of evaluating site performance. Criteria include land use, community structure, economic impact, access, visual character, noise, air pollution, natural environment, weather, air traffic, and terminal design.
M.J.S.

N75-21296# Aeronautical Research Labs., Melbourne (Australia).
THE SOLID BLOCKAGE OF A THREE-DIMENSIONAL MODEL FOR GROUND EFFECT EXPERIMENTS IN A CLOSED RECTANGULAR WIND TUNNEL
B. W. B. Shaw Aug. 1974 18 p refs
(ARL/A-Note-348) Avail: NTIS HC $3.25

The wind tunnel shape factor, required for calculating the solid blockage of a three-dimensional slender model, was computed for the case of ground effect experiments in a closed rectangular wind tunnel, with the aid of a digital computer. Suitable ranges of values of tunnel height/breadth ratio and non-dimensional height of the model above the tunnel floor were covered. The wind tunnel shape factor was also derived for the case of normal experiments with the model central. Results are presented. Author

N75-21297# Sandia Labs., Albuquerque, N.Mex. Experimental Aerodynamics Div.
WIND TUNNEL PRESSURE PROBES: NEW CALIBRATIONS FOR NEW GEOMETRIES AND FLOW ENVIRONMENTS
C. W. Peterson and O. L. George 1974 37 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Oct. 1975 Sponsored by ERDA
Avail: NTIS HC $3.75

Extensive calibrations of Pitot, static, and cone-static pressure probes were performed for probe geometries over a wide range of flow conditions so that routine, accurate flow field measurements can be made in support of current wind tunnel testing programs. Calibration data were obtained over a wide range of Mach number and freestream Reynolds number. Flat-tipped Pitot probes were calibrated for viscous and rarefaction phenomena. A correlation was derived which relates these flat probe results to round probe data over a typical range of flat probe aspect ratios. These probes were also calibrated for the effects of pitch and yaw in inviscid, viscous, and rarefied flow conditions. Calibrations of static and cone-static pressure probes were extended to values of the hypersonic viscous interaction parameter approaching nine. Author

N75-21298# Sandia Labs., Albuquerque, N.Mex.
CALIBRATION WIND TUNNEL FOR THE DEVELOPMENT OF HIGH SPEED FLOW FIELD DIAGNOSTIC TECHNIQUES
C. W. Peterson and C. W. Powers Dec. 1974 32 p refs Sponsored by ERDA
(SAND-74-0305) Avail: NTIS HC $3.75

A small calibration wind tunnel was constructed as a test bed for developing new wind tunnel instrumentation and calibrating existing probes in high-speed flows. Three open-jet nozzles with nominal Mach numbers of 2.5, 5.5, and 7.5 are operated over an exceptionally wide range of free-stream pressures and temperatures. Pitot probes were calibrated for viscous and rarefaction effects in the flows produced by these nozzles. The continuous operation and flexible design of the calibration wind tunnel make it suitable as a facility for basic research studies in fluid mechanics. Author (NSA)

N75-21299# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SUPER VACUUM INSTALLATION
F. M. Babenko and A. E. Yanov 9 Dec. 1974 17 p Transl. into ENGLISH from Russian Patent no. 343075 (22 Jun. 1972) 3 p
(AD-A002807; FTD-MT-24-215-75) Avail: NTIS CSCL 14/2
Reported is a double walled vacuum system for obtaining extremely low pressures by using mechanical, sorption, and condensate removal pumps cooled by cryogenic liquids of helium gas. Diffusion pumps are installed outside the chamber and cryogetters are applied both outside and inside chamber walls.
Author

N75-21300# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVICE FOR LAUNCHING MODELS
S. S. Kozlov and V. A. Chernousov 6 Dec. 1974 11 p Transl. into ENGLISH from Russian Patent no. 255078 (17 Oct. 1969) 3 p
(AD-A002823; FTD-HT-23-627-75) Avail: NTIS CSCL 14/2
At the present time pneumatic launchers, in which a brake cylinder is used to absorb the energy of moving parts, are being employed for launching various models for research purposes in a wind tunnel. However, these pneumatic launchers do not create high initial velocities because the brake cylinders fail at high speeds. In addition, only models with specific dimensions and at fixed initial angles of attack can be tested because the mount for the model is not adjustable and is rigidly connected to a rod. In the proposed device these shortcomings have been eliminated. This is done by replacing friction braking with compressed-air braking.
GRA

N75-21301# Air Force Systems Command, Wright-Patterson AFB, Ohio.
FIVE MINUTES BEFORE TAKEOFF
P. Savin 6 Dec. 1974 8 p Trans. into ENGLISH from Bakinskii Rabochii (USSR), no. 102, Apr. 1973 p 3, 30
(AD-A002815; FTD-HT-23-205-75) Avail: NTIS CSCL 01/3
At the present time the airport servicing of aircraft and the electrical starting of aircraft engines is accomplished by various electrical power sources on the ground.
GRA

N75-21302# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CONDITION SURVEY, FELKER ARMY AIRFIELD, FORT EUSTIS, VIRGINIA Final Report
Ralph D. Jackson Nov. 1974 24 p
(AD-A003168; AEWES-Misc-Paper-S-74-27) Avail: NTIS CSCL 01/5
Subsequent to publication in 1958 of the last report on the airfield pavement facilities at Felker Army Airfield, a new fixed-wing runway and other pavement facilities have been constructed. The report describes these facilities and presents a summary of the load-carrying capacities of pavement facilities at the airfield.
GRA

N75-21234 Royal Aircraft Establishment, Bedford (England).
THE IMPROVEMENT OF VISUAL AIDS FOR APPROACH AND LANDING
A. J. Smith and D. Johnson *In* AGARD Take-off and Landing Jan. 1975 15 p refs (For availability see N75-21219 13-01)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-21303*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE BACKGROUND FOR SKYLAB EXPERIMENT T-002, MANUAL NAVIGATION SIGHTINGS
Robert J. Randle and Stanley W. Powers (Air Force Acad.) Mar. 1975 23 p refs
(NASA-TM-X-62420; A-6004) Avail: NTIS HC $3.25 CSCL 2A
The background of the NASA-DOD manual navigation experiment (T002) on Skylab A is reviewed with emphasis on NASA's development of an error model for sextant measurements in midcourse navigation and on USAF's development of a low earth orbit manual navigation scheme. Instruments briefly described are a space sextant and space stadimeter, both of which are used by USAF in orbit navigation, the sextant by NASA in midcourse sightings. The rationale, data requirements, and data reduction procedures are discussed in terms of the goals of the agencies.
Author

N75-21304*# Martin Marietta Corp., Baltimore, Md.
EARTH RESOURCES EXPERIMENT PACKAGE SENSOR PERFORMANCE EVALUATION. VOLUME 2: S191 Final Report
Gerald P. Kenney 2 Jan. 1975 102 p refs
(Contract NAS8-24000)
(NASA-CR-141735; MSC-05546-Vol-2) Avail: NTIS HC $5.25 CSCL 22A
An S191 performance summary based on ground testing and orbital operations in terms of pertinent parameters is provided. Additional tasks covering S191 short-wavelength radiometric calibration, data-acquisition camera, and viewfinder tracking system design criteria, radiometric comparison of S190A, S191, and S192, and wavelength calibration data are included as supplemental analyses. Descriptions of techniques employed in the performance analyses are also discussed. Final results of the evaluations in terms of significant performance degradation, sensor and system anomalies, and achieved performance are presented. Conclusions were based on S191 performance and interaction of S191 with the EREP system. Recommendations for additional analyses and improvements in design and operation are presented.
Author

N75-21305*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE: ROAD WITHOUT END
A. G. Nikolayev Washington NASA Apr. 1975 237 p Transl. into ENGLISH of the book "Doroga bez Kontsa" Moscow, Molodaya Guardiya Press, 1974 270 p
(Contract NASw-2481)
(NASA-TT-F-16214) Avail: NTIS HC $7.50 CSCL 22A
The training and preparation of cosmonauts for space flights, the activities of spacecraft crews in orbit, and the prospects for future space research are reviewed. The duties and responsibilities of a pilot-cosmonaut are considered.
Author

N75-21306*# Scientific Translation Service, Santa Barbara, Calif.
COSMONAUTICS: PRESENT AND FUTURE (BASED ON MATERIAL FROM THE FOREIGN PRESS)
Leonid Efimovich Levant Washington NASA Apr. 1975 73 p Transl. into ENGLISH of the book "Kosmonavtika: Sostoyaniye i Perspektivy (Po Materialam Zarubezhnoy Pechati)" Moscow, Znaniye, 1974 p 2-64
(Contract NASw-2483)
(NASA-TT-F-16227) Avail: NTIS HC $4.25 CSCL 22A
The present state of American astronautics and the prospects for man's futher advances into space is reviewed. Major emphasis is placed on: launches of artificial earth satellites; flights of interplanetary space probes; and flights of manned spacecraft.
J.M.S.

N75-21307*# National Aeronautics and Space Administration, Washington, D.C.
EXPLORATION OF THE SOLAR SYSTEM
Arthur Henderson, Jr. and Jerry Grey (AIAA, New York) 1974 72 p Reprinted
(NASA-EP-122) Avail: NTIS MF $2.25; SOD HC $2.05 CSCL 01A
A sourcebook of information on the solar system and the technology used for its exploration is presented. An outline of the potential achievements of solar system exploration is given along with a course of action which maximizes the rewards to mankind.
Author

N75-21308*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: SAFETY ACTIVITIES
Charles N. Rice Washington Apr. 1975 18 p

(NASA-TN-D-7950; JSC-S-422) Avail: NTIS HC $3.25 CSCL 22C

A description is given of the flight safety experiences gained during the Apollo Program and safety, from the viewpoint of program management, engineering, mission planning, and ground test operations was discussed. Emphasis is placed on the methods used to identify the risks involved in flight and in certain ground test operations. In addition, there are discussions on the management and engineering activities used to eliminate or reduce these risks. Author

N75-21309*# Scientific Translation Service, Santa Barbara, Calif.
THE YEARS OF THE SPACE ERA
A. N. Ponomarev Washington NASA Apr. 1975 411 p refs Transl. into ENGLISH of the book "Gody Kosmicheskoy ery" Moscow, Military Press, 1974 p 1-289
(Contract NASw-2483)
(NASA-TT-F-16103) Avail: NTIS HC $10.50 CSCL 22A

The conquest of space is discussed. The Soyuz space vehicle, the orbiting spaceship Salyut, and the Apollo spacecraft used to land a man on the Moon are described along with their construction and rocket motors, and the cabin life support system. Author

N75-21310*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: GUIDANCE AND CONTROL SYSTEMS; LUNAR MODULE MISSION PROGRAMER
Jesse A. Vernon Washington Apr. 1975 12 p
(NASA-TN-D-7949; JSC-S-414) Avail: NTIS HC $3.25 CSCL 22C

A review of the concept, operational requirements, design, and development of the lunar module mission programer, is presented, followed by a review of component and subsystem performance during design-feasibility, design-verification, and qualification tests performed in the laboratory. The system was further proved on the unmanned Apollo 5 mission. Several anomalies were detected, and satisfactory solutions were found. These problems are defined and examined, and the corrective action taken is discussed. Suggestions are given for procedural changes to be used if future guidance and control systems of this type are to be developed. Author

N75-21311*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: COMMAND AND SERVICE MODULE SEQUENTIAL EVENTS CONTROL SUBSYSTEM
Gary W. Johnson Washington Apr. 1975 24 p ref
(NASA-TN-D-7951; JSC-S-436) Avail: NTIS HC $3.25 CSCL 22A

The Apollo command and service module sequential events control subsystem is described, with particular emphasis on the major systems and component problems and solutions. The subsystem requirements, design, and development and the test and flight history of the hardware are discussed. Recommendations to avoid similar problems on future programs are outlined. Author

N75-21312*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BALLISTIC INTERCEPT MISSIONS TO COMET ENCKE Final Report of the Comet Encke Ballistic Mission Engineering Panel
M. Mumma, comp. Mar. 1975 129 p refs
(NASA-TM-X-72542) Avail: NTIS HC $5.75 CSCL 22A

The optimum ballistic intercept of a spacecraft with the comet Encke is determined. The following factors are considered in the analysis: energy requirements, encounter conditions, targeting error, comet activity, spacecraft engineering requirements and restraints, communications, and scientific return of the mission. A baseline model is formulated which includes the basic elements necessary to estimate the scientific return for the different missions considered. Tradeoffs which have major impact on the cost and/or scientific return of a ballistic mission to comet Encke are identified and discussed. Recommendations are included. J.M.S.

N75-21313*# Battelle Columbus Labs., Ohio.
PROCESS DEVELOPMENT FOR PRODUCING FINE-GRAIN CASTING IN SPACE Final Report
S. H. Gelles and R. K. Malik 10 Apr. 1975 68 p refs
(Contract NAS8-29626)
(NASA-CR-120739) Avail: NTIS HC $4.25 CSCL 22A

Assessment of grain growth kinetics at temperatures near the melting point and investigation into the use of potential nucleating agents in combination with the naturally occurring BeO led to the definition of critical low-g experiments which would help to determine whether one or both of these possibilities are valid and whether space processing would be able to yield fine grain ingot beryllium. Author

N75-21314*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
[SYNOPSIS OF THE APOLLO PROGRAM ACTIVITIES AND TECHNOLOGY FOR LUNAR EXPLORATION] Apollo Program Summary Report
Apr. 1975 502 p refs
(NASA-TM-X-68725; JSC-09423) Avail: NTIS HC $12.25 CSCL 22A

Overall program activities and the technology developed to accomplish lunar exploration are discussed. A summary of the flights conducted over an 11-year period is presented along with specific aspects of the overall program, including lunar science, vehicle development and performance, lunar module development program, spacecraft development testing, flight crew summary, mission operations, biomedical data, spacecraft manufacturing and testing, launch site facilities, equipment, and prelaunch operations, and the lunar receiving laboratory. Appendixes provide data on each of the Apollo missions, mission type designations, spacecraft weights, records achieved by Apollo crewmen, vehicle histories, and a listing of anomalous hardware conditions noted during each flight beginning with Apollo 4. M.J.S.

N75-21315*# National Aeronautics and Space Administration, Washington, D.C.
BEFORE THE MEETING IN SPACE
V. A. Shatalov Apr. 1975 9 p Transl. into ENGLISH from Novoye Vremya (USSR), no. 1, Jan. 1975 p 20-24
(NASA-TT-F-16319) Avail: NTIS HC $3.25 CSCL 22A

The planned docking of Soyuz with Apollo in space is discussed. The experiments to be performed are considered along with the problems of the language barrier between the cosmonauts and astronauts. F.O.S.

N75-22258* Kanner (Leo) Associates, Redwood City, Calif.
MUTUAL ASSISTANCE IN SPACE
K. Bushuev *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 20-38 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 22-40 (For availability see N75-22255 13-99)
CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-21316 Wisconsin Univ., Madison.
POINTING ERROR ANALYSIS OF GEOSYNCHRONOUS SATELLITES Ph.D. Thesis
Aniruddha Das 1974 367 p
Avail: Univ. Microfilms Order No. 74-28796

Nonlinear and linear analyses of the pointing errors of flexible geosynchronous satellites are presented. Flexible satellite models, consisting of shells, plates, beams, rigid bodies, and point mass-spring-damper systems, arranged in spinning, dual-spin, and three-axes stabilized configurations are considered. Algorithms for computing uniform and time-optimal control torque sequences are derived and used to obtain the dynamic responses of the satellites. The effects of deterministic and noisy attitude measuring systems of the flexible satellites are analyzed. Stochastic stability criteria for the satellites in the presence of random torques and

measurement noises are proposed. It is shown that for a given control system, the pointing accuracy is increased if the motions of the flexible elements of the satellite are observed.
Dissert. Abstr.

N75-21317*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ON THE TESSERAL-HARMONICS RESONANCE PROBLEM IN ARTIFICIAL-SATELLITE THEORY Special Report
Barbara A. Romanowicz 28 Mar. 1975 55 p
(Grant NGR-09-015-002)
(NASA-CR-142672; SAO-Special-Rept-365) Avail: NTIS HC $4.25

The longitude-dependent part of the geopotential usually gives rise only to short-period effects in the motion of an artificial satellite. However, when the motion of the satellite is commensurable with that of the earth, the path of the satellite repeats itself relative to the earth and perturbations build up at each passage of the satellite in the same spot, so that there can be important long-period effects. In order to take these effects into account in deriving a theoretical solution to the equations of motion of an artificial satellite, it is necessary to select terms in the longitude-dependent part of the geopotential that will contribute significantly to the perturbations. Attempts made to obtain a selection that is valid in a general case, regardless of the initial eccentricity of the orbit and of the order of the resonance, are reported. The solution to the equations of motion of an artificial satellite, in a geopotential thus determined, is then derived by using Hori's method by Lie series, which, by its properties regarding canonical invariance, has proved advantageous in the classical theory. Author

N75-21318*# Analytical Mechanics Associates, Inc., Seabrook, Md.
HILTOP SUPPLEMENT: HELIOCENTRIC INTERPLANETARY LOW THRUST TRAJECTORY OPTIMIZATION PROGRAM, SUPPLEMENT 1
F. I. Mann and J. L. Horsewood Dec. 1974 105 p refs
(Contract NAS5-21963)
(NASA-CR-143699; Rept-74-30) Avail: NTIS HC $5.25 CSCL 22A

Modifications and improvements are described that were made to the HILTOP electric propulsion trajectory optimization computer program during calendar years 1973 and 1974. New program features include the simulation of power degradation, housekeeping power, launch asymptote declination optimization, and powered and unpowered ballistic multiple swingby missions with an optional deep space burn. Author

N75-21319*# International Business Machines Corp., Houston, Tex. Federal Systems Div.
IOP MODELING STUDY Final Report
26 Mar. 1975 6 p refs
(Contract NAS9-14444)
(NASA-CR-141745; Rept-75-SS-0582) Avail: NTIS HC $3.25 CSCL 22A

A detailed model of the IOP was developed and used to evaluate IOP performance and its effect of flight software performance. A redesign of FIOMCNTL, the MSC control program, is recommended. Author

N75-21320# Army Engineer Topographic Labs., Fort Belvoir, Va.
SATELLITE-TO-SATELLITE TRACKING STUDY FOR THE GLOBAL POSITIONING SYSTEM ROTATING-Y CONFIGURATION Special Report, Jul. - Dec. 1973
Edmundo Simental May 1974 62 p
(AD-A002626; ETL-SR-74-6) Avail: NTIS CSCL 17/7

A global satellite positioning system is evaluated. The methods and techniques involved in satellite-to-satellite tracking to determine orbital accuracies are described, and results of these accuracies are presented. The positional accuracy of ground users relative to the global satellite positioning system orbits in real-time and near-real-time modes is made using simulated data. GRA

N75-21321# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
THE DATA EDITOR/DOCTOR (THE SECOND GENERATION ORBITAL IMPROVEMENT PROGRAM)
B. J. Hook and H. D. Black 28 Oct. 1974 76 p refs Revised
(AD-A003348; APL/JHU-TG-756) Avail: NTIS CSCL 17/7

A partial description of the data reduction computer program is given. GRA

N75-21966* Kanner (Leo) Associates, Redwood City, Calif.
NAVIGATIONAL ASSIGNMENT OF SCIENTIFIC MEASUREMENTS
P. Ye. Elyasberg and B. V. Kugayenko *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 104-111 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 155-166 (For availability see N75-21952 13-59)
CSCL 22A

N75-21967* Kanner (Leo) Associates, Redwood City, Calif.
ESTIMATION OF THE ACCURACY WITH WHICH THE POSITION OF THE CENTER OF MASS OF AN INTERKOSMOS SERIES ARTIFICIAL EARTH SATELLITE IS CALCULATED
P. Ye. Elyasberg, B. V. Kugayenko, and M. I. Voyskovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 112-126 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 167-187 (For availability see N75-21952 13-59)
CSCL 22A

N75-21969* Kanner (Leo) Associates, Redwood City, Calif.
ANALYTICAL METHOD FOR CALCULATION OF NAVIGATIONAL DATA FOR THE POSITION OF A SATELLITE
P. Lala *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 132-138 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 194-202 (For availability see N75-21952 13-59)
CSCL 22A

N75-21970* Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF THE SATELLITE ATTITUDE AND ITS MOTION ABOUT THE CENTER OF MASS
I. G. Khatskevich *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 139-144 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 203-213 (For availability see N75-21952 13-59)
CSCL 22A

N75-21971* Kanner (Leo) Associates, Redwood City, Calif.
NEW METHODS FOR THE NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS AND THEIR APPLICATION TO THE EQUATIONS OF MOTION OF SPACECRAFT
A. Banyukevich and K. Ziolkovski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 145-151 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 214-223 (For availability see N75-21952 13-59)
CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-21322*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
EXPERIMENT DEFINITION PHASE SHUTTLE LABORATORY LDRL 10.6 EXPERIMENT Quarterly Report, 26 Jun. - 26 Sep. 1974
15 Oct. 1974 45 p
(Contract NAS5-20018)
(NASA-CR-143709; D0824; SCG-40355R; QR-1) Avail: NTIS HC $3.75 CSCL 14B

System optimization is reported along with mission and parameter requirements. Link establishment and maintenance requirements are discussed providing an acquisition and tracking scheme. The shuttle terminal configurations are considered and are included in the experiment definition. M.C.F.

N75-21323*# George Washington Univ., Washington, D.C. Science Communication Div.
SCIENTIFIC PUBLICATIONS AND PRESENTATIONS RELATING TO PLANETARY QUARANTINE. VOLUME 5: THE 1974 SUPPLEMENT
F. D. Bradley May 1975 43 p
(Contract NASw-2768)
(NASA-CR-142648; GWU-SCD-75-07P) Avail: NTIS HC $3.75 CSCL 22D

Documents relating to planetary quarantine are cited. The citations are assembled to update the survey of germane literature in this area. Availability of the documents is included. Author

N75-21324# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CONSTRUCTION OF AXISYMMETRIC 1/4-SCALE MODEL OF MINUTEMAN LAUNCH FACILITY FOR SMI FIELD TEST PROGRAM, EVENT 1 Final Report
Roger D. Crowson Dec. 1974 64 p
(AD-A003171; AEWES-Misc-Paper-N-74-2) Avail: NTIS CSCL 16/1

One axisymmetric model having representative design features found in Minuteman launch facilities was built to a 1/4 scale of the prototype facility. The model was built for the SMI Field Test Program Event I. Structurally nonessential features were not included and structurally essential design features were modified to an axisymmetric configuration. The design and drawings of the model built for PHASE II-GRABS were altered for use in this study. The material properties of the steel and concrete used in the model were similar to those used in the prototype. Smaller aggregates were used in the model concrete and equivalent steel percentages were maintained between model and prototype. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-21325 Texas Univ., Austin.
STATISTICAL ORBIT ESTIMATION AND CONTROL FOR A NEAR EARTH AUTONOMOUS SATELLITE Ph.D. Thesis
Baylus Earls Bennett 1974 204 p
Avail: Univ. Microfilms Order No. 75-4326

The concept of a near earth autonomous satellite capable of maintaining its orbital altitude and period deviations within specified tolerances is investigated. Circular polar orbits of 100nm and 500nm are used as test case orbits. The autonomous satellite obtains range and range rate information continuously at six second intervals from a combination of geostationary relay satellites. A linear discrete Kalman filter is employed to provide estimates of the autonomous satellite's state. This information is utilized by the control logic to compute the required impulsive orbit correction. The results indicate that an autonomous satellite is capable of controlling a specified orbit within nominal altitude deviations of seven kilometers and period deviations of two seconds for a baseline set of uncertainties. The baseline set consisted of an uncertainty of five meters in the position components of the relay satellites, and an inital difference of 200 meters and one meter/second in the position and velocity components respectively of the autonomous satellite. Dissert. Abstr.

N75-21326 Texas A&M Univ., College Station.
TWO DIMENSIONAL MATHEMATICAL MODEL OF A PROPELLANT LINED HYPERVELOCITY LAUNCH TUBE Ph.D. Thesis
Michael McKenzie Tower 1974 138 p
Avail: Univ. Microfilms Order No. 75-2902

The problem presented is the formulation of a mathematical model of an explosive propellant lined hypervelocity projectile launcher. The model is used to perform a parametric study to assess the various aspects critical for proper opeation of a hypervelocity launcher. The hypervelocity gun considered differs from the classical gun in that the projectile ignites a thin coating of explosive on the inner surface of the gun barrel, thus causing a high pressure gas to be maintained near the projectile's base. The consequence is to provide a higher base pressure to the pellet, thus accelerating the projectile to higher velocities than otherwise obtainable in a conventional gun system. The most significant conclusion is that gas being added from the burning of a thin film explosive bore coating near the base of the moving projectile will increase the projectile velocity substantially over that obtained in a similar conventional hypervelocity gun system. Dissert. Abstr.

N75-21327*# Hughes Aircraft Co., Torrance, Calif. Space Systems Div.
STUDY OF A LOW ALTITUDE SATELLITE UTILIZING A DATA RELAY SATELLITE SYSTEM, PHASE 2 Final Report
Dennis Eggert Aug. 1969 153 p
(Contract NAS5-11602)
(NASA-CR-143719; B-6560) Avail: NTIS HC $6.25 CSCL 22B

The technical considerations associated with a low altitude satellite (LAS) operating in conjunction with a data relay satellite system (DRSS) were investigated. A spacecraft conceptual design based upon the results of analysis and trade studies dealing with LAS-DRSS communication and with LAS subsystems is presented. The following major aspects of the spacecraft design are described: (1) payloads; (2) orbital parameters; (3) basic elements of the comminication system (the antenna, carrier frequency, RF power, and link capacity); (4) the antenna control system; (5) attitude and velocity control system; (8) power system; and (9) the fundamental considerations involved in the LAS configuration. J.M.S.

N75-21328*# Hughes Aircraft Co., Torrance, Calif. Space Systems Div.
STUDY OF A LOW ALTITUDE SATELLITE UTILIZING A DATA RELAY SATELLITE SYSTEM, PHASE 1 Final Report
Dennis Eggert 21 Jan. 1969 326 p refs
(Contract NAS5-11602)
(NASA-CR-143720) Avail: NTIS HC $9.50 CSCL 22B

Technical considerations associated with a low altitude satellite (LAS) operating in conjunction with a data relay satellite system (DRSS) are investigated. The impact of providing the capability of transmitting data to and receiving from a system of DRSS on the spacecraft design is studied with emphasis on antenna pointing, antennas, communication system, and attitude control. Potential applications for LAS-DRSS are discussed in order to develop ranges for parameters associated with various spacecraft systems such as communication, control, and power systems. Results of analysis and trade studies dealing with LAS-DRSS communication and LAS subsystems are presented. J.M.S.

N75-21329*# Boeing Aerospace Co., Seattle, Wash.
RADIATION AND SHIELDING STUDY FOR THE INTERNATIONAL ULTRAVIOLET EXPLORER Final Report
M. Baze, R. H. Firminhac, W. E. Horne, R. C. Kennedy, P. R. Measel, L. L. Sivo, and M. C. Wilkinson Oct. 1974 153 p refs
(Contract NAS5-20038)
(NASA-CR-143711; D180-18486-1) Avail: NTIS HC $6.25 CSCL 22B

Technical advisory services to ensure integrity of parts and

material exposed to energetic particle radiation for the IUE scientific instruments, spacecraft, and subsystems are provided. A significant potential for interference, degradation, or failure for unprotected or sensitive items was found. Vulnerable items were identified, and appropriate tests, changes, and shields were defined. Author

N75-21330*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TITAN/CENTAUR T/C-1 POST FLIGHT EVALUATION REPORT
Apr. 1975 389 p
(NASA-TM-X-71692; E-8293) Avail: NTIS HC $10.25 CSCL 22B

The Titan/Centaur-1 is evaluated in support of the mission objectives. Titan, Centaur, and Centaur standard shroud systems are described, and their performance are evaluated. Author

N75-21331# Army Engineer Topographic Labs., Fort Belvoir, Va.
GEODETIC SECOR SATELLITE Report for 1960-1970
Robert H. Nichols Jun. 1974 38 p
(DA Proj. 4A6-23501-D-853)
(AD-A002625; ETL-TR-74-6) Avail: NTIS CSCL 08/5

This report covers the development of the satellite portion of the Geodetic Sequential Collation of Range (SECOR) System. The purpose of the system was to provide geodetic coordinates of a ground point located from 160 to 4800 kilometers from known geodetic positions. The system consisted of four or more transportable ground stations which electronically determined distances to a satellite-borne transponder. Subject matter discussed herein will be primarily confined to the historical development of the satellite/transponder portion of the SECOR System. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N75-21332*# Alabama Univ., Huntsville.
EDUCATIONAL PLANNING FOR UTILIZATION OF SPACE SHUTTLE (ED-PLUSS). EXECUTIVE SUMMARY: IDENTIFICATION AND EVALUATION OF EDUCATIONAL USES AND USERS FOR THE STS
Harry A. Engle and David L. Christensen Feb. 1975 41 p
(Contract NAS8-30737)
(NASA-CR-120727) Avail: NTIS HC $3.75 CSCL 22A

The development and application of educational programs to improve public awareness of the space shuttle/space lab capabilities are reported. Special efforts were made to: identify the potential user, identify and analyze space education programs, plan methods for user involvement, develop techniques and programs to encourage new users, and compile follow-on ideas. E.H.W.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N75-21333*# Hughes Aircraft Co., Torrance, Calif. Space Systems Div.
MULTIPATH STUDY FOR A LOW ALTITUDE SATELLITE UTILIZING A DATA RELAY SATELLITE SYSTEM Final Report
Dennis Eggert Oct. 1970 113 p refs
(Contract NAS5-11602)
(NASA-CR-143718; Hughes-Ref-B6560; SSD-00513R) Avail: NTIS HC $5.25 CSCL 17B

Technical considerations associated with a low altitude satellite operating in conjunction with a data relay satellite system are reported. Emphasis was placed on the quantitative characterization of mulipath phenomenon and determination of power received via both the direct and earth reflection paths. Attempts were made to develop a means for estimating the magnitude and nature of the reflected power. E.H.W.

N75-21334# Lockheed Missiles and Space Co., Palo Alto, Calif.
RADIO TELEMETRY SYSTEM ELEMENTS WITH PULSE-CODE MODULATION
F. I. Barsukov and Iu. B. Rusanov [1975] 26 p Transl. into ENGLISH from the book "Elementy i Ustroistva Radiotelemetricheskikh Sistem" Moscow, Energiia, 1973 p 167-205
Avail: NTIS HC $3.75; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A review of analog and digital data converters is presented. The following data converters are described: analog to digital converters; binary to decimal converters; decimal to binary converters; and digital to analog converters. J.M.S.

N75-21335*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRACKING AND DATA SYSTEM SUPPORT FOR THE PIONEER PROJECT. VOLUME 2: PIONEER 11 PRELAUNCH PLANNING THROUGH SECOND TRAJECTORY CORRECTION, TO 1 MAY 1973
W. R. Barton and R. B. Miller 15 Mar. 1975 142 p refs 3 Vol.
(Contract NAS7-100)
(NASA-CR-142698; JPL-TM-33-584-Vol-2) Avail: NTIS HC $5.75 CSCL 22C

The tracking and data system support of the planning, testing, launch, near-earth, and deep space phases of the Pioneer 11 Jupiter Mission are described, including critical phases of spacecraft flight and guidance. Scientific instruments aboard the spacecraft registered information relative to interplanetary particles and fields. Knowledge of the celestial mechanics of the solar system was improved through radiometric data gathering. Network performance, details of network support activity, and special support activities are discussed. Author

N75-21336# Frequency and Time Systems, Inc., Danvers, Mass.
CESIUM-ATOMIC BEAM OSCILLATOR TECHNOLOGY FOR NAVIGATION SATELLITES
2 Oct. 1975 27 p
(Contract N00014-74-C-0061)
(AD-A003017) Avail: NTIS CSCL 17/7

A program of research and exploratory development is directed toward cesium-beam-stabilized oscillators for navigation satellite applications. The report summarizes the breadboard design concepts and provides some preliminary information on proposed circuits, components, and packaging of the final flight-candidate design. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-21337# Rome Univ. (Italy).
STABILITY OF FLEXIBLE SPACECRAFTS
Paolo Santini Feb. 1975 58 p Presented at the 25th Intern., Astronautical Congr., Amsterdam, 30 Sep. - 5 Oct. 1974
(Preprint-5) Avail: NTIS HC $4.25

The general equations of a flexible spacecraft in a gravitational field are discussed. The motion of a generic point of the body

is described as the superposition of a rigid motion plus a combination of structural modes. The general equations for the motion of a particle of the body are written. The equations of momentum and moment of momentum are derived. All the terms appearing in such equations are very general. Equations for gravitational torques and for the generic vibration mode amplitude include the effect of flexural deformations and of higher harmonics of the gravitational field. Stability of the motion around a given configuration is studied, for both nonspinning, and for spinning satellites. Numerical examples are included. Author

N75-21338*# National Aeronautics and Space Administration, Washington, D.C.
PRESS CONFERENCE ON APOLLO SOYUZ TEST PROJECT: USA-USSR
11 Apr. 1975 128 p
(NASA-TM-X-69031) Avail: NASA Scientific and Technical Information Facility P.O. Box 8757, Baltimore/Washington International Airport, Md. 21240 CSCL 22B

Test systems for rendezvous and docking of future manned spacecraft and stations that would be suitable for use as a standard international system are reported. This system will include rendezvous and docking of Apollo and Soyuz spacecraft and crew transfer. Data also cover undocking, interaction of control centers, and interaction of spacecraft crews. E.H.W.

N75-21339*# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
ANALYSIS OF RAE-1 INVERSION Final Report
David A. Hedland and Paul K. Degonia Nov. 1974 114 p refs
(Contract NAS5-20083-2)
(NASA-CR-143697) Avail: NTIS HC $5.25 CSCL 22A

The RAE-1 spacecraft inversion performed October 31, 1972 is described based upon the in-orbit dynamical data in conjunction with results obtained from previously developed computer simulation models. The computer simulations used are predictive of the satellite dynamics, including boom flexing, and are applicable during boom deployment and retraction, inter-phase coast periods, and post-deployment operations. Attitude data, as well as boom tip data, were analyzed in order to obtain a detailed description of the dynamical behavior of the spacecraft during and after the inversion. Runs were made using the computer model and the results were analyzed and compared with the real time data. Close agreement between the actual recorded spacecraft attitude and the computer simulation results was obtained. Author

N75-21340*# Grumman Aerospace Corp., Bethpage, N.Y.
COMPOSITE REINFORCED PROPELLANT TANKS Final Report
Lawrence D. Brown, Michael J. Martin, Benjamin J. Aleck, and Robert Landes Feb. 1975 203 p refs
(Contract NAS3-14368)
(NASA-CR-134726) Avail: NTIS HC $7.25 CSCL 22B

Design studies involving weight and cost were carried out for several structural concepts applicable to space shuttle disposable tankage. An effective design, a honeycomb stabilized pressure vessel, was chosen. A test model was designed and fabricated. Author

N75-21341*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PRELIMINARY VIBRATION, ACOUSTIC, AND SHOCK DESIGN AND TEST CRITERIA FOR COMPONENTS ON THE HEAO-A SPACECRAFT
Apr. 1975 61 p
(NASA-TM-X-64919) Avail: NTIS HC $4.25 CSCL 22B

These vibration, acoustic, and shock specifications provide the qualification test criteria for spacecraft components and subassemblies and for the High Energy Astronomy Observatory (HEAO-A) experiments. The HEAO-A was divided into zones and subzones to obtain simple component groupings. Zones are designated primarily to assist in determining the applicable specification. A Subzone is available for use when the location of the component is known but component design and weight are not well defined. When the location, weight, and mounting configuration of the component are known, the appropriate Subzone weight ranges are available. Experiment and specific component specifications are available. Author

N75-21342*# Chrysler Corp., New Orleans, La. Space Div.
SUBSONIC AND TRANSONIC AERODYNAMIC CHARACTERISTICS ASSOCIATED WITH VARIATIONS IN THE GEOMETRY OF THE FORWARD PORTION OF IRREGULAR PLANFORM WINGS ON A .01875 SCALE LO-100 LANGLEY CONCEPT SPACE SHUTTLE ORBITER IN THE LANGLEY 8 FOOT TPT (LA7B)
J. E. Vaughn and D. E. Poucher Mar. 1973 590 p refs
(Contract NAS9-13247)
(NASA-CR-141512; DMS-DR-2091) Avail: NTIS HC $13.25 CSCL 22B

The experimental longitudinal-and lateral-directional stability characteristics of a Langley conceptual space shuttle orbiter design were obtained for a series of inboard planform fillets in the NASA/LaRC 8-foot transonic pressure tunnel. Fillet sweep angles up to 78 deg were investigated while holding the spanwise intersection of the fillet and wing constant. The data were obtained at Mach numbers of 0.35 to 1.2 and at Reynolds numbers (depending on Mach number) of 1,000,000 to 3,200,000 per foot. The angle of attack was varied from about -2 deg to 22 deg at sideslip. Author

N75-21343*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN AUTOMATIC DATA SYSTEM FOR VIBRATION MODAL TUNING AND EVALUATION
Robert A. Salyer (TRW Systems Group, Redondo Beach, Calif.), Ed J. Jung, Jr., Stacy L. Huggins (Northrop, Inc., Houston, Texas), and Barry L. Stephens Washington Apr. 1975 44 p refs
(NASA-TN-D-7945; JSC-S-435) Avail: NTIS HC $3.75 CSCL 22B

A digitally based automatic modal tuning and analysis system developed to provide an operational capability beginning at 0.1 hertz is described. The elements of the system, which provides unique control features, maximum operator visibility, and rapid data reduction and documentation, are briefly described; and the operational flow is discussed to illustrate the full range of capabilities and the flexibility of application. The successful application of the system to a modal survey of the Skylab payload is described. Information about the Skylab test article, coincident-quadrature analysis of modal response data, orthogonality, and damping calculations is included in the appendixes. Recommendations for future application of the system are also made. Author

N75-21344*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF INVESTIGATION ON AN 0.004-SCALE 140C MODIFIED CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (74-0) IN THE NASA/LANGLEY RESEARCH CENTER HYPERSONIC NITROGEN TUNNEL (OA89)
P. J. Hawthorne (Rockwell Intern., Downey, Calif.) Mar. 1975 66 p
(Contract NAS9-13247)
(NASA-CR-141513; DMS-DR-2214) Avail: NTIS HC $4.25 CSCL 22B

Wind tunnel test data for the modified space shuttle vehicle orbiter is documented. Tests were made at various elevon settings and additionally in wing off/bodyflap off configuration at angles of attack from -5 to 42.5 degrees at zero yaw. Data obtained on high hypersonic longitudinal and lateral directional stability and control characteristics of the updated SSV configuration in an initially diatomic medium are included. Author

N75-21345*# Essex Corp., Huntsville, Ala.
A STUDY OF PAYLOAD SPECIALIST STATION MONITOR SIZE CONSTRAINTS
Mark Kirkpatrick, III, Nicholas L. Shields, Jr., and Thomas B. Malone Feb. 1975 120 p refs
(Contract NAS8-30545)
(NASA-CR-120731; H75-10) Avail: NTIS HC $5.25 CSCL 22B

Constraints on the CRT display size for the shuttle orbiter cabin are studied. The viewing requirements placed on these monitors were assumed to involve display of imaged scenes providing visual feedback during payload operations and display

of alphanumeric characters. Data on target recognition /resolution, target recognition, and range rate detection by human observers were utilized to determine viewing requirements for imaged scenes. Field-of-view and acuity requirements for a variety of payload operations were obtained along with the necessary detection capability in terms of range-to-target size ratios. The monitor size necessary to meet the acuity requirements was established. An empirical test was conducted to determine required recognition sizes for displayed alphanumeric characters. The results of the test were used to determine the number of characters which could be simultaneously displayed based on the recognition size requirements using the proposed monitor size. A CRT display of 20 x 20 cm is recommended. A portion of the display area is used for displaying imaged scenes and the remaining display area is used for alphanumeric characters pertaining to the displayed scene. The entire display is used for the character alone mode. Author

N75-21346*# Harris Corp., Melbourne, Fla. Electronic Systems Div.
STUDY OF SPACE SHUTTLE ORBITER SYSTEM MANAGEMENT COMPUTER FUNCTION. VOLUME 1: ANALYSIS, BASELINE DESIGN Final Report
Feb. 1975 147 p refs
(Contract NAS9-13887)
(NASA-CR-141758; Rept-9330-75-005-Vol-1) Avail: NTIS HC $5.75 CSCL 22B

A system analysis of the shuttle orbiter baseline system management (SM) computer function is performed. This analysis results in an alternative SM design which is also described. The alternative design exhibits several improvements over the baseline, some of which are increased crew usability, improved flexibility, and improved growth potential. The analysis consists of two parts: an application assessment and an implementation assessment. The former is concerned with the SM user needs and design functional aspects. The latter is concerned with design flexibility, reliability, growth potential, and technical risk. The system analysis is supported by several topical investigations. These include: treatment of false alarms, treatment of off-line items, significant interface parameters, and a design evaluation checklist. An in-depth formulation of techniques, concepts, and guidelines for design of automated performance verification is discussed. Author

N75-21347*# Harris Corp., Melbourne, Fla. Electronic Systems Div.
STUDY OF SPACE SHUTTLE ORBITER SYSTEM MANAGEMENT COMPUTER FUNCTION. VOLUME 2: AUTOMATED PERFORMANCE VERIFICATION CONCEPTS Final Report
Feb. 1975 99 p refs
(Contract NAS9-13887)
(NASA-CR-141759; Rept-9330-75-005-Vol-2) Avail: NTIS HC $4.75 CSCL 22B

The findings are presented of investigations on concepts and techniques in automated performance verification. The investigations were conducted to provide additional insight into the design methodology and to develop a consolidated technology base from which to analyze performance verification design approaches. Other topics discussed include data smoothing, function selection, flow diagrams, data storage, and shuttle hydraulic systems. M.J.S.

N75-21348*# Chrysler Corp., New Orleans, La. Data Management Services.
SPACE SHUTTLE VEHICLE FERRY CONFIGURATION AFTERBODY FAIRING EFFECTS ON 140A/B ORBITER AERODYNAMIC CHARACTERISTICS USING AN .0405 SCALE MODEL ORBITER (43-0) IN THE ROCKWELL INTERNATIONAL 7.75 X 11 FT LOW SPEED WIND TUNNEL (OA123)
R. C. Mennell (Rockwell Intern., Los Angeles) Apr. 1975 80 p
(Contract NAS9-13247)
(NASA-CR-141526; DMS-DR-2202) Avail: NTIS HC $4.75 CSCL 22B

The primary test objectives were to define ferry configuration afterbody fairing effects on orbiter stability and control characteristics and to substantiate wind tunnel results. Parametric variations consisted entirely of testing different afterbody fairing contours in an effort to improve both the orbiter drag levels and lateral-directional control characteristics. The three afterbody contours that were tested consisted of the Boeing TC3 beavertail, the new Rockwell-Boeing TC4 fairing, and a modification of an existing short bumblebee fairing redesignated TC6. Author

N75-21349*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF AN INVESTIGATION ELEVON HINGE MOMENTS AND DUAL PANEL ELEVON EFFECTIVENESS USING AN .0405-SCALE MODEL (16-0) OF THE CONFIGURATION 140C SPACE SHUTTLE ORBITER IN THE ROCKWELL INTERNATIONAL NAAL LOW SPEED WIND TUNNEL (OA119B)
R. C. Mennell (Rockwell Intern., Los Angeles, Calif.) Apr. 1975 458 p
(Contract NAS9-13247)
(NASA-CR-141524; DMS-DR-2203) Avail: NTIS HC $11.50 CSCL 22B

Experimental aerodynamic investigations were conducted on a sting mounted .0405-scale representation of the 140C outer mold line space shuttle orbiter in a 7.75 x 11.00 foot low speed wind tunnel during the time period from August 22, 1974 to September 6, 1974. The primary test objectives were to define dual panel elevon/aileron effectiveness and to investigate elevon hinge-moments for the 140C orbiter configuration with wing/elevon upper hingeline sealing flapper doors. The elevon parametric variations, consisting of the basic elevons with 6 inch gaps and flapper doors, elevons with no flapper doors and completely open upper hingeline gap, and an entirely sealed solid elevon, were tested with elevon deflections from +20 to -35 deg at various aileron deflections. Aerodynamic force and moment data were measured in the body axis system by a 2.5 inch task type internal strain gage balance. Author

N75-21350*# Chrysler Corp., New Orleans, La. Space Div.
WIND TUNNEL TESTS OF AN 0.019-SCALE SPACE SHUTTLE INTEGRATED VEHICLE -2A CONFIGURATION (MODEL 14-OTS) IN THE NASA AMES 8 BY 7 FOOT UNITARY WIND TUNNEL (IA12C), VOLUME 1
R. B. Hardin (Rockwell Intern., Downey, Calif.) and R. R. Burrows (Rockwell Intern., Downey, Calif.) Apr. 1975 382 p
(Contract NAS9-13247)
(NASA-CR-141518; DMS-DR-2065-Vol-1) Avail: NTIS HC $10.25 CSCL 22B

The purpose of the test was to determine the effects of cold jet gas plumes on (1) the integrated vehicle longitudinal and lateral-directional force data, (2) exposed wing hinge moment, (3) wing pressure distributions, (4) orbiter MPS external pressure distributions, and (5) model base pressure. The similarity between solid and gaseous plumes was investigated, and fluorescent oil flow visualization studies were conducted. Author

N75-21351*# Chrysler Corp., New Orleans, La. Data Management Services.
WIND TUNNEL TESTS OF AN 0.019-SCALE SPACE SHUTTLE INTEGRATED VEHICLE -2A CONFIGURATION (MODEL 14-OTS) IN THE NASA AMES 8 X 7 FOOT UNITARY WIND TUNNEL, VOLUME 2
R. B. Hardin (Rockwell International Corp., Downey, Calif.) and R. R. Burrows (Rockwell International Corp., Downey, Calif.) Apr. 1975 991 p
(Contract NAS9-13247)
(NASA-CR-141519; DMS-DR-2065-Vol-2) Avail: NTIS HC $21.25 CSCL 22B

The purpose of the test was to determine the effects of cold jet gas plumes on (1) the integrated vehicle longitudinal and lateral-directional force data, (2) exposed wing hinge moment, (3) wing pressure distributions, (4) orbiter MPS external pressure distributions, and (5) model base pressures. An investigation was undertaken to determine the similarity between solid and gaseous plumes; fluorescent oil flow visualization studies were also conducted. Plotted wing pressure data is tabulated. Author

N75-21352*# Chrysler Corp., New Orleans, La. Data Management Services.
WIND TUNNEL TESTS OF AN 0.019-SCALE SPACE SHUTTLE INTEGRATED VEHICLE -2A CONFIGURATION

(MODEL 14-OTS) IN THE NASA AMES 8 X 7 FOOT UNITARY WIND TUNNEL, VOLUME 3
R. B. Hardin (Rockwell International Corp., Downey, Calif.) and R. R. Burrows (Rockwell International Corp., Downey, Calif.) Apr. 1975 1079 p
(Contract NAS9-13247)
(NASA-CR-141520; DMS-DR-2065-Vol-3) Avail: NTIS HC $25.25 CSCL 22B

Tests were conducted to determine the effects of cold jet gas plumes on (1) the integrated vehicle longitudinal and lateral-directional force data, (2) exposed wing hinge moment, (3) wing pressure distributions, (4) orbiter MPS external pressure distributions, and (5) model base pressures. An investigation was undertaken to determine the similarity between solid and gaseous plumes; fluorescent oil flow visualization studies were also conducted. Tabulated data listings are included. Author

N75-21353# California Univ., Livermore. Lawrence Livermore Lab.
MODEL OF SM-2 (ER)
M. E. Brown and P. T. Herman 14 Oct. 1974 28 p refs
(Contract W-7405-eng-48)
(UCID-16606) Avail: NTIS HC $3.75 CSCL 16D

The model is symmetric about the longitudinal axis of the missile. It was necessary to homogenize various missile components over fictitious volumes, particularly the dorsal fins and control surfaces of the missile. NSA

N75-21354# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Guidance and Control Directorate.
TERMINAL HOMING ENGINEERING FLIGHT TEST T7 AND MT7 MISSILE LAUNCH TRANSIENTS DATA REDUCTION AND SUMMARY
J. Knoblach 29 Aug. 1974 33 p
(DA Proj. 1M2-63310-D-074)
(AD-A003241; RG-75-12) Avail: NTIS CSCL 16/4

The launch transients at tipoff for forty-six T7 and MT7 missile launches are compiled, grouped according to Quadrant Elevation Angle, and the mean tipoff transients and standard deviations thereof are calculated. Results are discussed generally in terms of launch rail rigidity, wind velocity components, and rail/shoe dynamics. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-21355 Virginia Univ., Charlottesville.
GASEOUS-FUELLED NUCLEAR ROCKET ENGINE Ph.D. Thesis
Lee H. Bettenhausen 1974 220 p
Avail: Univ. Microfilms Order No. 75-4666

An energy exchange and nuclear reactor model for a gaseous fuelled nuclear rocket engine is examined. The model uses best available temperature dependent thermophysical properties for energy exchange computations. Reactor computations use readily available reactor calculational codes and a well known 16-energy-group cross section set. The reactor computational method was extensively tested against available experimental data for gaseous core reflector moderated reactors before being used to calculated criticality and reactivity effects of the engine model. Appendices describe the thermophysical data used for uranuum plasmas at temperatures from 5000 to 120,000 K at pressures up to 1000 atm., hydrogen from 30 to 100,000 K at 500 atm. pressure, and beryllia and porous ceramics in the temperature range 100 to 2500 K. Results of the study include temperature, neutron flux, and fission density radial profiles and a comparison of computed and available reactivity coefficients for the model engine. Dissert. Abstr.

N75-21356# Materials Research Labs., Maribyrnong (Australia).
PHYSICAL STRENGTH TEST FOR EXIT CONE OF MOTOR ASSEMBLIES FOR ROCKET HEAT 66 mm L1A2
J. H. Cole and B. J. Baxter Jan. 1975 21 p
(MRL-TN-360) Avail: NTIS HC $3.25

A brief description is given of the equipment used to carry out the physical strength test on the exit cone of motor assemblies for Rocket HEAT 66 mm L1A2 manufactured in Australia. An outline is also given of the method of calibrating the equipment. Detailed instructions for calibrating and using the equipment are appended. Author

N75-21357*# Auburn Univ., Ala. Engineering Experiment Station.
A MONTE CARLO INVESTIGATION OF THRUST IMBALANCE OF SOLID ROCKET MOTOR PAIRS Final Report
Richard H. Sforzini, Winfred A. Foster, Jr., and Joseph S. Johnson, Jr. Nov. 1974 171 p refs
(Contract NCA8-77-Mod-12)
(NASA-CR-120700) Avail: NTIS HC $6.25 CSCL 21H

A technique is described for theoretical, statistical evaluation of the thrust imbalance of pairs of solid-propellant rocket motors (SRMs) firing in parallel. Sets of the significant variables, determined as a part of the research, are selected using a random sampling technique and the imbalance calculated for a large number of motor pairs. The performance model is upgraded to include the effects of statistical variations in the ovality and alignment of the motor case and mandrel. Effects of cross-correlations of variables are minimized by selecting for the most part completely independent input variables, over forty in number. The imbalance is evaluated in terms of six time - varying parameters as well as eleven single valued ones which themselves are subject to statistical analysis. A sample study of the thrust imbalance of 50 pairs of 146 in. dia. SRMs of the type to be used on the space shuttle is presented. The FORTRAN IV computer program of the analysis and complete instructions for its use are included. Performance computation time for one pair of SRMs is approximately 35 seconds on the IBM 370/155 using the FORTRAN H compiler. Author

N75-21358*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESULTS OF TC-1 BOOST PUMP ICING TESTS IN THE SPACE POWER FACILITY
L. C. Gentile and Robert J. Walter Feb. 1975 44 p ref
(NASA-TM-X-71671; E-8170) Avail: NTIS HC $3.75 CSCL 13K

A series of tests were conducted in the space power facility to investigate the failure of the Centaur oxidizer boost pump during the Titan/Centaur proof flight February 11, 1974. The three basic objectives of the tests were: (1) demonstrate if an evaporative freezing type failure mechanism could have prevented the pump from operating, (2) determine if steam from the exhaust of one of the attitude control engine could have entered a pump seal cavity and caused the failure, and (3) obtain data on the heating effects of the exhaust plume from a hydrogen peroxide attitude control engine. Author

N75-21359*# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPMENT OF TECHNOLOGY FOR FLUID-STRUCTURE INTERACTION MODELING OF A 1/8-SCALE DYNAMIC MODEL OF THE SHUTTLE EXTERNAL TANK (ET). VOLUME 1: TECHNICAL REPORT Final Report
M. Bernstein, R. Coppolino, J. Zalesak, and P. W. Mason Aug.

1974 174 p refs 2 Vol.
(Contract NAS1-10635)
(NASA-CR-132549-1) Avail: NTIS HC $6.25 CSCL 13D

A NASTRAN analysis of the external tank (ET) substructure of the 1/8-scale space shuttle structural dynamics model is described. The NASTRAN hydroelastic procedures were used to form a model of the liquid oxygen portion of the ET. Large computer storage requirements and running times were required unless these procedures were modified. Several possibilities were demonstrated including the substitution of the real for the complex eigenvalue routine and the use of the OMIT capability to reduce the number of fluid coordinates. A NASTRAN model of the complete ET was formed and reduced to 252 degrees of freedom. A review of the eigenvector extracted, using the unsymmetrical inverse power method, indicated that the structural OMIT's resulted in unsatisfactory modal deflections. Modifications to the NASTRAN hydroelastic capability appeared necessary to generate a successful ET model. An approach is described which, by assuming incompressibility, reduces the fluid representation to a symmetric mass matrix which can be added to the structural mass. The problem is solved using faster and more efficient eigenvalue routines. Using this approach the ET NASTRAN model was analyzed for three separate weight conditions. Author

N75-21360*# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPMENT OF TECHNOLOGY FOR FLUID-STRUCTURE INTERACTION MODELLING OF A 1/8-SCALE DYNAMIC MODEL OF THE SHUTTLE EXTERNAL TANK (ET). VOLUME 2: SUPPORTING DATA APPENDIXES A THROUGH C Final Report
M. Bernstein, R. Coppolino, J. Zalesak, and P. W. Mason Aug. 1974 436 p refs 2 Vol.
(Contract NAS1-10635)
(NASA-CR-132549-2) Avail: NTIS HC $11.25 CSCL 13D
For abstract, see N75-21359.

N75-21361# Naval Ordnance Station, Indian Head, Md.
ROCKET MOTORS MK 74-75 SURVEILLANCE EVALUATION
5 Dec. 1974 25 p refs
(AD-A002389) Avail: NTIS CSCL 21/8

The purpose of this evaluation was to test the safety, serviceability and reliability of rocket motors Mk 74/75 in NAVY stocks. GRA

N75-21362# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.
MINUTEMAN STAGE 1 MOTOR RELIABILITY IMPROVEMENT PROGRAM SURVEILLANCE Semiannual Test Results Report
John A. Thompson Jun. 1974 31 p
(AD-A002882; MANCP-300(74)) Avail: NTIS CSCL 21/8

This report contains data and test results from the Minuteman Stage I Reliability Program (RIP) Surveillance. Thiokol (see TWR-7300) tested and reported this program for eight years and on 1 July 1973, the responsibility was turned over to this laboratory. This report covers first time resting and reporting of RIP data by this laboratory. The data is compared with Thiokol data and is presented in the same format as in Thiokol's final report. The results are plotted on Thiokol's format which includes Thiokol's data. In the future, the data will be programmed into the G085 computer system and a statistical approach recommended by the statistical group will be used to present the data. The purpose of testing is to provide early warning of any serious degradation trends occurring in the component service life predictions. GRA

N75-21363# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE SCIENTIFIC RESULTS OF THE FLIGHT OF THE AUTOMATIC IONOSPHERIC LABORATORY "YANTAR 4"
G. L. Grozdovskii, Yu. I. Danilov, and V. E. Nikitin 27 Nov. 1974 17 p refs Transl. into ENGLISH from the book "Intern., Astronautikal Federation, 24th" Baku, Azerbaidzhan SSP, 1973 p 1-16
(AD-A002966; FTD-HT-23-187-75) Avail: NTIS CSCL 21/3

The possibility of guided flight in the upper atmosphere was investigated by the automatic ionospheric laboratory 'Yantar'. Results of the flights are compared. It is shown that characteristics of the plasma-ion engine operating in ionosphere are stable, and the ion jet is effectively neutralized by electrons from the plasma neutralizer. Author

N75-21364# Fairchild Republic Div., Farmingdale, N.Y.
PULSED PLASMA PROPULSION TECHNOLOGY Interim Report, 10 May 1973 - 10 Jul. 1974
Dominic J. Palumbo, Martin Begun, and William J. Guman Jul. 1974 85 p refs
(Contract F04611-72-C-0053; AF Proj. 3058)
(AD-A003419; AFRPL-TR-74-50) Avail: NTIS CSCL 21/3

An engineering prototype pulsed plasma propulsion system delivering 1mlb (4.45mN) of thrust at a specific impulse of 1794s and having a total impulse capability of 38,284 lb-s (166,00Ns) has been designed and completely fabricated. The thrust efficiency is 31.5% and the overall system efficiency is 25.3%. The system, including structure, capacitors, breadboard power converter and propellant weighs 50.23lb (22.8kg). GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-21365 Utah Univ., Salt Lake City.
COAL TAR AUTOXIDATION-KINETIC STUDIES BY VISCOMETRIC AND REFRACTOMETRIC METHODS Ph.D. Thesis
Yung-Yi Lin 1974 105 p
Avail: Univ. Microfilms Order No. 75-5014

The auto-oxidation of coal tars (boiling point up to 300 C) from bituminous coal hydrogenated at 650 C and carbonization (at 700 C) processes was studied under ordinary storage conditions. Both the viscosity and the refraction of the coal tars increased continuously during the autoxidation. Infrared spectra show that double bonds diminish, and oxygen containing functional groups in the tar increase as it is oxidized in air. This result corresponds very well with the decrease of iodine number. At oxygen pressures greater than 50 mm, the rate of oxidation is independent of the oxygen partial pressure. The viscosity increment is linear with the reaction time indicating that the autoxidation of coal tar is a diffusion controlled reaction. The activation energy of coal tar autoxidation from the hydrogenation process is about 9.07 Kcal/mole. The behavior of coal tars produced by hydrogenation is compared with that for tars produced from carbonization. Dissert. Abstr.

N75-21366# Michigan State Univ., East Lansing.
PROCEEDINGS OF THE 11TH RARE EARTH RESEARCH CONFERENCE. VOLUME 1: SESSIONS K - W
J. M. Haschke, ed. and H. A. Eick, ed. 1974 662 p refs Proc. held at Traverse City, Mich., 7-10 Oct. 1974 Sponsored by ERDA
(Conf-741002-P2-Vol-2) Avail: NTIS HC $15.25

Selected papers are presented in the following related fields of study: bio-inorganic chemistry; coordination chemistry; magnetics; metal physics and metallurgy; organometallic chemistry; solid state science; and spectroscopy. For vol. 1, see N75-19418. J.M.S.

N75-21367# California Univ., Los Angeles. Dept. of Chemistry.
NIDO-METALLOBORANES DERIVED FROM B10H102 MINUS
Timm E. Paxson and M. Frederick Hawthorne 15 Nov. 1974 31 p
(Contract N00014-69-A-0200-4019; NR Proj. 053-481)
(AD-A002742; TR-83) Avail: NTIS CSCL 07/3

Anhydrous K2B10H10 was found to react with LLPtCl2 complexes where L = triphenylphosphine or LL = 1,2-bis (diphenylphosphino)ethane, diphos, in ethanolic chloroform to form isomeric ethoxy-substituted nido-metalloboranes, LLPtB10H11OC2H5. These complexes are derivatives of the LLPtB10H12 metalloboranes, and arise from the polyhedral

expansion of the closo-borane anion. This reaction is one of the few examples in which the B10H10(2-) skeleton is radically altered. GRA

N75-21368# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE KINETICS AND MECHANISM OF THE HYDROGENATION OF BENZENE AND OF THE DEHYDROGENATION OF CYCLOHEXANE OVER NICKEL UNDER CONDITIONS WHERE THE PROCESS IS REVERSIBLE
S. L. Kiperman, B. S. Gudkov, and N. E. Zlotina 5 Nov. 1974 36 p refs Transl. into ENGLISH from the book "Probl. Kinetiki i Kataliza. 15. Mekhanizm i Kinetika Geterogennykh Reaktsii" Moscow, Izd. vo Nauka, 1973 p 110-125
(AD-A002817; FTD-MT-24-1757-74) Avail: NTIS CSCL 07/3

The development in the catalysis field shows that one of the primary methods of constructing a general theory of catalytic processes at the present time is to study the mechanisms of the individual reaction and to accumulate and generalize the data obtained. The entire study was made with a nickel catalysts applied on zinc oxide whose properties were simultaneously given through study in the catalyst research laboratory. M.C.F.

N75-21369# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHOTOCHROMIC SUBSTANCES
Stefan Paszyc 19 Nov. 1974 18 p refs Transl. into ENGLISH from Chemik (Poland), v. 26, no. 11/12, 1973 p 425-428
(AD-A002811; FTD-HC-23-63-75) Avail: NTIS CSCL 07/5

Industrial applications of photochromic substances is discussed, with special attention given to micropicture photographs, switches for computers, and special optical glass. GRA

N75-21370# Houston Research, Inc., Tex.
OXIDATION OF REFRACTORY ORGANIC MATERIALS BY OZONE AND ULTRAVIOLET LIGHT Final Report
Cecil G. Hewes, III, H. William Prengle, Jr., Charles E. Mauk, and O. David Sparkman Nov. 1974 115 p refs
(Contract DAAK02-74-C-0239)
(AD-A003091; HRI-7184) Avail: NTIS CSCL 07/5

An experimental study of an advanced chemical oxidation system was carried out to determine the rates of oxidation of difficult to oxidize, refractory, chemical species which are not removed by conventional secondary treatment plus carbon absorption. One representative was chosen for this investigation from each of the five types of refractories in municipal wastewater, alcohol, acid, amino acid, fatty acid, and polyhydroxyl alcohol. A refractory index scale was established to provide a means of comparing the resistance to oxidation of refractory compounds. All of the refractories investigated benefited by at least an order of magnitude increase in reaction rate when UV and ozone are used over that obtained when ozone alone is used. The work proves the technical feasibility of the process concept and provides preliminary data on mass transfer, reaction rate, and ozone autodecomposition for pilot scale work. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-21371 Texas Univ., Austin.
DEFORMATION AND FRACTURE OF BUNDLE-AND-DRAW FIBER COMPOSITES Ph.D. Thesis
William Hubert Craig 1974 138 p
Avail: Univ. Microfilms Order No. 75-4344

The fracture characteristics are studied of metal fiber-metal matrix composites fabricated by the bundle-and-draw process. These specimens, consisting of molybdenum or tungsten fibers embedded in copper or aluminum matrices, have been tested in uniaxial tension at 77 K, 195 K, and 298 K and have been found to fail by two different modes an instantaneous mode in which composite failure is concurrent with failure of the first fiber and a stepwise mode in which additional composite elongation occurred subsequent to the first fiber break and prior to final composite failure. The fibers extracted from these composites have been found to display significant variations in tensile strengths and/or strains-to-failure. This variation in properties arises from a variation in fiber diameters produced by the fabrication process. Dissert. Abstr.

N75-21372*# Texas A&M Research Foundation, College Station. Mechanics and Materials Research Center.
STRESS RELAXATION AND MECHANICAL PROPERTIES OF RL-1973 AND PD-200-16 SILICONE RESIN SPONGE MATERIALS Final Report, 6 Jun. 1974 - 28 Apr. 1975
D. Saylak, J. S. Noel, J. S. Ham, and R. McCoy Apr. 1975 181 p refs With Appendix A
(Contract NAS1-13342)
(NASA-CR-132622) Avail: NTIS HC $4.25 CSCL 11D

Stress relaxation tests were conducted by loading specimens in double-lap shear to a preselected strain level and monitoring the decay of stress with time. The stress relaxation response characteristics were measured over a temperature range of 100 to 300 K and four strain levels. It is concluded that only a slight amount of stress relaxation was observed, and the stiffness increased approximately two orders of magnitude over the range of temperatures. F.O.S.

N75-21373*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL DISPLACEMENTS AND VIBRATIONS OF CANTILEVERED UNSYMMETRIC FIBER COMPOSITE LAMINATES
M. D. Minich and C. C. Chamis 1975 13 p refs Prepared for presentation at 16th Struct., Structural Dyn. and Mater. Conf., Denver, 27-29 May 1975; sponsored by AIAA, ASME and SAE
(NASA-TM-X-71699; E-8306) Avail: NTIS HC $3.25 CSCL 11D

A fiber composite flat cantilever plate that has symmetric and nonsymmetric laminate configurations is theoretically investigated to determine its static and dynamic structural response. The finite element analysis method used includes a unique triangular finite element developed at Lewis for the analysis of fiber composite airfoils. The various responses investigated include tip displacements, natural frequencies, and fundamental mode shapes. The results show that the displacements and the natural frequencies can be in considerable error for nonsymmetric laminate configurations if the membrane-bending coupling is not taken into account. Structural response results obtained from ten laminate configurations are presented in tabular forms and may be used as an aid in selecting laminate configurations for composite airfoils. Author

N75-21374*# United Aircraft Corp., East Hartford, Conn. Research Labs.
DESIGN, FABRICATION AND TEST OF MULTI-FIBER LAMINATES
R. A. Pike and R. C. Novak Jan. 1975 190 p refs
(Contract NAS3-17778)
(NASA-CR-134763; R75-911730-15) Avail: NTIS HC $7.00 CSCL 11D

Unidirectional and angleply multifiber laminates were tested for improved impact strength and other mechanical properties. The effects of several variables on the mechanical properties of epoxy matrix materials were described. These include fiber type (HMS and AS graphites, glass, and Kevlar 49), ratio of primary to hybridizing fiber and hybrid configuration. It is demonstrated that AS graphite/S glass in an intraply configuration results in the best combination of static and Charpy impact properties as well as superior ballistic impact resistance. Pendulum impact tests which were conducted on thin specimens are shown to produce different ranking of materials than tests conducted on standard thickness Charpy specimens. It is shown that the thin specimen results are in better agreement with the ballistic impact data. Additional static test data are reported as a function of temperature for the seven best hybrid configurations having epoxy, polyimide (PMR-15) and polyphenylquinoxaline resins as the matrix. Author

N75-21375*# Monsanto Research Corp., Dayton, Ohio.
PREPARATION, TESTING, AND DELIVERY OF LOW DENSITY POLYIMIDE FOAM PANELS
George L. Ball, III, Larry K. Post, and Ival O. Salyer Apr. 1975

21 p refs
(Contract NAS2-8440)
(NASA-CR-137670; MRC-DA-490) Avail: NTIS HC $3.25 CSCL 13H

Plastic foams based on polyimide resins were shown to be stable at relatively high temperatures, and to possess very low flame spread and smoke generation characteristics. A system and process were developed to prepare low-density polyimide foam from a liquid formulation. The system is based on the reaction of micropulverized grade pyromellitic dianhydride with a polymeric diisocyanate. The panels produced were postcured at elevated temperatures to achieve maximum thermal and fire resistance, and incorporation of a fire retardant into the formulation was considered. The effects of a flame retardant (Flameout 5600B1) were investigated, but eliminated in preference to the postcuring approach. Author

N75-21376# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
HIGH TEMPERATURE CREEP PROPERTIES OF ALUMINUM-GRAPHITE COMPOSITES
W. C. Harrigan, Jr. and W. W. French 10 Mar. 1975 28 p refs
(ATR-75(9450)-2) Avail: NTIS HC $3.75

High temperature creep tests were conducted on aluminum-graphite composites. Test temperatures were between 350 and 450 C. Three matrix alloys: 6061, 201, and 202, were combined with Thornel 50 fibers by the process of molten infiltration to form the composites. The stress exponent for creep of these composites is shown to be approximately 7, and the activation energy for creep is shown to be 150 kJ/mol. Scanning electron microscopy is used to demonstrate reasons for the low stress dependence and activation energy. Author

N75-21377# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
FATIGUE TESTING TECHNIQUES FOR EVALUATING THE EFFECTS OF ENVIRONMENT ON COMPOSITE MATERIALS
Michael D. Hanson Oct. 1974 16 p
(DA Proj. 1F2-62209-AH-76)
(AD-A003321; USAAMRDL-TN-18) Avail: NTIS CSCL 11/4

Composite materials are finding an increasing usefulness in aircraft structures which are subject to long-term, uncontrolled weathering conditions. In order to obtain data that are representative of actual operating conditions, cantilever bending fatigue testing of plus or minus 45F fiberglass epoxy specimens and graphite epoxy composite specimens was initiated on outdoor and indoor test equipment. After trying several unsuccessful modifications to the test procedure, it became obvious that state-ot-the-art, metal testing techniques did not yield valid data. It was decided to abandon the free-vibration approach. An indoor shaker table was modified to produce a fixed deflection on the specimen with a system of actuator arms. Tests were run to determine the fatigue life at different magnitudes of deflection using this system, and they proved to be successful. GRA

N75-21378# Aerospace Corp., El Segundo, Calif. Lab. Operations.
ADVANCED CARBON-CARBON MATERIALS FOR SOLID ROCKET NOZZLES Interim Report
J. G. Baetz 15 Dec. 1974 24 p refs
(Contract F04701-74-C-0075)
(AD-A003405; TR-0075(5546)-2; SAMSO-TR-74-258) Avail: NTIS CSCL 11/4

The use of advanced carbon-carbon materials to improve the overall performance of solid rocket nozzles is presented. The materials that are currently under development for reentry and propulsion application are examined in terms of advanced solid rocket nozzle requirements. Basic processing methods, reinforcement and construction, types of matrices, coatings, erosion and the matrix/reinforcement relationship are discussed. GRA

N75-21379# Aerospace Corp., El Segundo, Calif. Lab. Operations.
FABRICATION OF ALUMINUM-GRAPHITE COMPOSITE Interim Report
William C. Harrigan, Jr. 9 Dec. 1974 18 p
(Contract F04701-74-C-0075)
(AD-A003404; TR-0075(9250-03)-2; SAMSO-TR-74-253)
Avail: NTIS CSCL 11/4

For several years, aluminum-graphite composites have been produced by molten infiltration of continuous tows of graphite fibers. Typically, this composite is in the form of rods or wire approximately 0.050 in. in diameter. Larger size specimens are required in order to evaluate the transverse strength and modulus of the composite. The pressing of larger specimens would also allow one to produce sections of hardware for demonstration and evaluation. For these reasons, a study was made of parameters to fabricate aluminum-graphite composite sheets using rod precursor. The results of this study are described in this report. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N75-21380 Nebraska Univ., Lincoln.
MODEL FOR PREDICTING OUTCOME OF HEAT PULSE EXPERIMENTS Ph.D. Thesis
Dennis Lee Albers 1974 147 p
Avail: Univ. Microfilms Order No. 75-3407

A model for predicting the outcome of low temperature heat pulse experiments in pure crystals is presented. A new approximate method for solving the phonon Boltzmann equation is developed which is exact both in the limit of vanishing scattering (the ballistic limit) and in the limit of infinitely rapid normal process scattering (the hydrodynamic limit). The Model gives a treatment of the transition from the ballistic to the hydrodynamic behavior that occurs as the ambient temperature of a crystal is raised. The effects of the different group velocities for longitudinal and transverse phonons, of the finite rate at which phonons are transferred from the heater to the crystal, and of the spatial extent of the heater and detector can all be treated by the model. It is shown that the shapes of the observed pulses are critically affected by the limited spatial extent of the heater and detector and by the finite rate at which phonons are transferred from the heater to the crystal. Dissert. Abstr.

N75-21381 Minnesota Univ., Minneapolis.
ANALYSIS OF SOME MODELS FOR NONISOTHERMAL CONTINUOUS FLUIDIZED BED CATALYTIC REACTORS Ph.D. Thesis
Dragomir Branislav Bukur 1974 256 p
Avail: Univ. Microfilms Order No. 75-2169

A classical two phase model for division of gas flow together with catalyst particles as a third phase is used to describe a nonisothermal continuous fluidized bed catalytic reactor. Various subcases of this basic model are considered depending upon the assumed mixing pattern of the interstitial gas and the catalyst particles. The experimental and/or theoretical correlations for model parameters are presented and examined. Some basic assumptions which are common to all types of fluidized bed reactor models that are considered are also stated. A model (incorporating the age dependence of particle variables) is developed assuming complete mixing of particles (PMA-model). Some numerical steady state calculations are presented for reactions with both a nondecaying and decaying catalyst. Dissert. Abstr.

N75-21382 Cincinnati Univ., Ohio.
COMPUTERIZED KINETIC LUMINESCENCE SPECTROSCOPY Ph.D. Thesis
Theodore Lee Miller 1974 193 p
Avail: Univ. Microfilms Order No. 75-3357

A computer-controlled laser phosphorimeter is described. The

form of data acquisition utilized by this system is unique in that the phosphroescence spectra are recorded on magnetic tape as signal-averaged, families of decay curves. The utility of this data format is illustrated in the analysis of phosphorescence spectra of samples exhibiting nonexponential decay. An extremely flexible and simple procedure for the generation of time-resolved spectra is described. The technique of component-resolved spectroscopy is discussed in detail and illustrated by the resolution of the phosphorescence spectra of the constituents from the emission of a binary mixture. The results of a systematic examination of eleven aromatic carbonyl compounds with the computerized kinetic luminescence spectroscopy system are also described. The degree of nonexponentiality and the time-resolved spectra are used to classify the molecular luminescence of these compounds. Three classes of molecular luminescence were identified among the compounds investigated and a discussion for each class is presented. Dissert. Abstr.

N75-21383 Tennessee Univ., Knoxville.

QUANTITATIVE X-RAY PHOTOELECTRON SPECTROSCOPY AND APPLICATIONS TO AIR POLLUTION Ph.D. Thesis

William Jackson Carter 1974 137 p

Avail: Univ. Microfilms Order No. 75-3578

A simple model was proposed for use in the quantitative X-ray photoelectron spectroscopy of solids. It involved two basic parameters for obtaining relative elemental analysis: the photoelectron cross section for ionization and the mean free path of the photoejected electron. The cross sections were atomic calculations and the mean free path, based on empirical data, was approximated as the square root of the kinetic energy of the photoelectron. The parameters used in the construction of the model and other considerations are discussed with regard to its validity. The experimental data were obtained on a 180 deg double-focusing spherical-sector electrostatic spectrometer. The relative intensities for nine pure compounds examined in the gaseous state by Mg K alpha radiation were determined in order to assess the value of the cross sections. Approximately 15 pure solids were studied by both Mg K alpha and Al K alpha photon sources in order to obtain an evaluation of the overall theory. Dissert. Abstr.

N75-21384#* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MAGNETIZATION AND MAGNETIC SUSCEPTIBILITY OF DyH3

D. J. Flood 1974 11 p refs Presented at Am. Phys. Soc. Meeting, Denver, 31 Mar. - 3 Apr. 1975

(NASA-TM-X-71698; E-8303) Avail: NTIS HC $3.25 CSCL 07D

The magnetization and differential magnetic susceptibility of powdered samples of DyH3 have been measured at 4.2 K in applied magnetic fields ranging to 9 Teslas. The differential magnetic susceptibility has also been studied in zero applied field as a function of temperature. The magnetization data are described by an equation of the form M = [aB/(1 + bB] + cB. The ratio a/b is a measure of the saturation magnetization and gives an effective moment of 5.12 Bohr magnetons per ion. The zero field susceptibility exhibits a maximum at T = 3.45 K, and an inflection point near 2.85 K. The susceptibility at 4.2 K has a 1/B squared dependence on the applied magnetic field for B approximately greater than 0.3 Teslas. Author

N75-21385*# Kanner (Leo) Associates, Redwood City, Calif.

SELF-BROADENING OF PRINCIPAL SERIES LINES OF RUBIDIUM AT HIGH NUMBER DENSITIES

H. J. Kusch Washington NASA Apr. 1975 17 p refs Transl. into ENGLISH from Z. Phys. (West Germany), v. 25, 1972 p 257-268

(Contract NASw-2481)

(NASA-TT-F-16301) Avail: NTIS HC $3.25 CSCL 07D

Self-broadening of principal series lines of rubidium was studied using a steel absorption tube heated in an electric furnace. Line profiles were obtained with a grating spectrograph of high resolution in the temperature range 350 to 420 C corresponding to number densities of 18.6 to 119 X 10 to the 15th power/cubic centimeters. The half-widths of the lines disagree with classical impact calculations using dipole-dipole interaction but approach the asymptotic value of the quantum-mechanical polarization theory of Reinsberg. Author

N75-21386*# Kanner (Leo) Associates, Redwood City, Calif.

SPECTRON DIFFRACTION INVESTIGATION OF K2SO4, Cs2SO4 AND K2CrO4 MOLECULES IN THE GASEOUS STATE

V. P. Spiridonov and B. I. Lutoshkin Washington NASA Mar. 1975 9 p refs Transl. into ENGLISH from Vest. Mosk. Univ. (Moscow), v. 11/5, 1970 p 509-513

(Contract NASw-2481)

(NASA-TT-F-16199) Avail: NTIS CSCL 07D

Sector-microphotometric techniques were used in comparing the theoretical and experimental curves of intensity for the vapors of the compounds. The molecules are all found to have type II structures, that is, the SO4 and CrO4 groups have regular tetrahedra, with the alkaline atoms arranged on the perpendicular to the opposite edges of the tetrahedron. The internuclear distances in a alkaline elements were compared with fluorides of the same elements to generalize the findings. Author

N75-21387*# Kanner (Leo) Associates, Redwood City, Calif.

POTENTIAL DISTRIBUTION IN LIQUID FLOW-THROUGH POROUS CARBON ELECTRODES

H. Chino, M. Yamashita, and M. Kubokawa Washington NASA Mar. 1975 14 p refs Transl. into ENGLISH from Denki Kagaku Oyohi Kogyo Butsuri Kagaku (Japan), v. 42, no. 5, 1974 p 231-236

(Contract NASw-2481)

(NASA-TT-F-16205) Avail: NTIS HC $3.25 CSCL 07D

The potential distribution in liquid flow-through porous carbon electrodes as a function of the cathode reactions of dissolved oxygen and hydrogen peroxide was investigated. The potential distribution depends on the electrolyte flow rate, its flow direction and the current density. The theoretical and experimental correlation of total current and frontal polarization of the porous electrode was shown. The advantages in using a thin electrode with hydrogen peroxide and in applying electrolyte flow from the front of the electrode were discussed. Author

N75-21388*# Kanner (Leo) Associates, Redwood City, Calif.

DETERMINATION OF CALCIUM, BARIUM, ZINC, SULFUR AND PHOSPHORUS IN LIQUID HYDROCARBONS BY X-RAY FLUORESCENCE USING THE CORRECTED INTENSITIES METHOD

J. Faucherre, B. Grubis, and R. VieLeSage Washington NASA 23 Apr. 1975 18 p refs Transl. into ENGLISH from Bull. Soc. Chim. France (Masson), no. 2, 1972 p 850-868

(Contract NASw-2481)

(NASA-TT-F-16255) Avail: NTIS HC $3.25 CSCL 07B

In the case of uniform liquid solutions such as doped oils and additives, the method of corrected intensities by double determination at two dilution ratios theoretically makes it possible to eliminate the solubility matrix effect. This method requires no assumptions as to the nature of the sample and involves the use of a light solvent, which makes it possible to obtain optimum conditions of fluorescent intensity. Author

N75-21389# Nuclear Enterprises Ltd., Reading (England).

MEASUREMENT OF THE SULPHUR CONTENT OF REFINERY PRODUCTS BY X-RAY ABSORPTIOMETRY

T. B. Rowley Sep. 1974 24 p refs Sponsored by Commission of the European Communities

(EURISOTOP-93) Avail: ERDA Depository Libraries HC $4.25

Reasons for removal of S from refinery products to meet environmental protection legislation and product specification and the conventional methods used for S determination are discussed. Two types of S monitors based on the use of isotope X-ray sources are described. One model is designed for use in process control laboratories giving considerable reduction of time required for S determination. The second model is for continuous on-line monitoring of product streams at line pressure and temperature. Digital signal processing is used in both models to achieve optimum precision. The economic advantages to refinery operation of rapid and continuous S measurement are briefly discussed. Author (NSA)

N75-21390# Danish Atomic Energy Commission, Risoe.
DYNAMICS OF LIQUID HYDROGEN AND LIQUID NITROGEN STUDIED BY INELASTIC NEUTRON SCATTERING Ph.D. Thesis
K. DaCostaCarneiro May 1974 54 p refs
(RISO-308) Avail: ERDA Depository Libraries HC $4.25

The assumption for the ideal phonon theory used to describe lattice dynamics is analyzed, and noncrystalline materials are classified according to which assumptions are obeyed and which are violated. Neutron scattering results from liquid H2 are critically analyzed with the result that the concept of phonons must be introduced to understand this liquid, and consequently the phonons are quantitatively discussed. In liquid N2, no evidence of phonons is seen in the neutron scattering pattern, in agreement with results for liquid Ar. The influence of the rotational degrees of freedom in liquid N2 is briefly discussed. Results presented together with similar results for the liquids Ar, He, and Rb support the classification and indicate how further understanding of the dynamics of liquids may be gained. The use of a neutron triple-axis crystal spectrometer in the study of liquids is also discussed. Author (NSA)

N75-21391# Los Alamos Scientific Lab., N.Mex.
FUNDAMENTAL ASPECTS OF SYSTEMS FOR THE THERMOCHEMICAL PRODUCTION OF HYDROGEN FROM WATER
M. G. Bowman Oct. 1974 11 p refs Presented at 1st Natl. Topical Meeting on Nucl. Process Heat Appl., Los Alamos, New Mexico, 1 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1459; Conf-741032-2) Avail: NTIS HC $3.25

The thermochemical production of hydrogen by direct use of primary heat is a strong motivation for research to develop optimized processes. Maximum efficiency will be realized only if the thermochemical cycle is optimized for the temperature of the heat source. This implies that each heat source will require a different process. In order to conduct a systematic program of selecting useful processes from the very large number potentially available, it will be advantageous to delineate the thermodynamic, kinetic, engineering and economic criteria required for an optimum process and then conduct a vigorous theoretical and experimental program to identify cycles that approximate these criteria. This paper demonstrates one method of applying thermodynamic criteria in the synthesis of thermochemical processes for water splitting. Author (NSA)

N75-21392# Brookhaven National Lab., Upton, N.Y.
OPERATING MANUAL FOR THE PSE AND G HYDROGEN RESERVOIR CONTAINING IRON TITANIUM HYDRIDE
G. Strickland and J. J. Reilly Feb. 1974 39 p refs
(Contract AT(30-1)-16)
(BNL-50421) Avail: NTIS HC $3.75

Information is provided on how the reservoir functions and how it can be safely operated. The equipment is described, and basic operating procedures are given, along with precautionary measures. As operating experience is gained, more detailed procedures can be prepared for interfacing the reservoir with the other major components comprising the energy-storage system. Author (NSA)

N75-21393# Aktiebolaget Atomenergi, Studsvik (Sweden).
X-RAY ELASTIC CONSTANTS FOR CUBIC MATERIALS
K. Malen Oct. 1974 25 p refs
(AE-500) Avail: ERDA Depository Libraries HC $4.25

The stress-strain relation to be used in X-ray stress measurements in anisotropic texture-free media is studied. The method for evaluation of appropriate elastic constants for a cubic medium is described. Some illustrative numerical examples were worked out including line broadening due to elastic anisotropy. The elastic stress and strain compatibility at grain boundaries is taken into account using Kroner's method. These elastic constants apply when no internal stresses due to plastic deformation are present. The case of reorientation of free interstitials in the stress field can be taken into account. Author (NSA)

N75-21394# Atomic Energy Board, Pretoria (South Africa).
THERMODYNAMIC PROPERTIES AND PHASE DIAGRAM OF TERNARY SODIUM ALLOYS, 2: THE SYSTEM SODIUM PLUS LEAD PLUS INDIUM
A. J. Neethling Apr. 1974 19 p refs
(PEL-232) Avail: ERDA Depository Libraries HC $4.00

The emf measurements at 670 to 760 K were used to determine the thermodynamic properties of the Na component. Corresponding functions for the Pb and In components were calculated with Darken's method. Integral properties for the system are also tabulated. Thermal analysis was used to determine the solid-liquid equilibrium surface for the ternary system. Author (NSA)

N75-21395# Sandia Labs., Albuquerque, N.Mex.
CORRELATION BETWEEN EXPLOSION TIMES AND INITIAL MOLAR CONTENT FOR METAL DROPLETS BURNING IN AIR
L. S. Nelson, J. M. Freese, and N. L. Richardson 1974 18 p refs Presented at the Meeting of the Western States Sect./The Combust. Inst., Northridge, Calif., 21-22 Oct. 1974 Sponsored by ERDA
(SAND-74-5169) Avail: NTIS HC $3.25

The free-fall combustion of submillimeter-diameter droplets of eleven transition and rare earth metals in dry air was studied by a laser ignition technique. Each metal burned in a similar, coherent manner and exploded after a reproducible combustion time. For a given droplet diameter, a linear correlation between the time to explode and the number of moles of metal present in the droplet upon ignition was discovered. The oxygen transfer rate is constant from metal to metal. Since it is unlikely that all eleven metals have identical intrinsic oxygen uptake rates, the oxygen supply must be limited by diffusion through the boundary layer which surrounds the droplets for the combustion conditions studied here. These experiments place a lower limit on the intrinsic oxygen uptake rates of the eleven molten metals during high temperature oxidation. Author (NSA)

N75-21396# Allied Chemical Corp., Idaho Falls, Idaho. Operations Office.
[NONROUTINE, SIGNIFICANT SERVICES AND SUPPORTING DEVELOPMENT IN ANALYTICAL CHEMISTRY FOR FY-1974] Annual Report, 1974
R. C. Shank Oct. 1974 211 p refs
(Contract AT(10-1)-1375)
(ICP-1056) Avail: NTIS HC $7.25

Non-routine, significant analytical services and supporting development work for FY-1974 are presented. The analytical and technical support activities for the Idaho Chemical Programs and other NRTS and outside contractors include mass spectrometry, gas chromatography, atomic absorption spectrophotometry, emission spectrography, X-ray diffractometry, radiochemistry, spectrophotometry, titrimetry, gravimetry, coulometry, quality control, and remote techniques. Improvement of equipment, analytical techniques, and methods are a significant part of this report. Twenty-five items were indexed separately. Author (NSA)

N75-21397# California Univ., Livermore. Lawrence Livermore Lab.
[CHEMICAL RESEARCH PROGRESS, INCLUDING STUDIES IN IONIC CHLORIDES, EXPLOSIVE COMPOSITES, MASS SPECTROMETRY, AND GEOTHERMAL BRINES] Quarterly Report, Jul. - Sep. 1974
J. E. Harrar, comp. 1974 25 p refs
(Contract W-7405-eng-48)
(UCID-15644-74-3) Avail: NTIS HC $3.25

Progress is reported in the following studies: determination of ionic chloride in TATB; faster method of determining isocyanates; analysis of explosive composites; applications of ion-selective electrodes; measurement of HF produced by LX-09 explosives new universal detectors for gas chromatography; gas chromatograph-microwave spectrometer system; laser Stark spectroscopy; upgrading of the gas analytical mass spectrometer; simulation modeling of a mixed-oxided fuel-rod fabrication plant; effects of particles in geothermal brines; separators for electrolysis cells made from fluoropolymer ion-exchange membranes, and modification of the Auger electron spectrometer. NSA

N75-21398# National Bureau of Standards, Boulder, Colo. Cryogenic Engineering Lab.
A COMPARISON OF TWO MELTING PRESSURE EQUATIONS CONSTRAINED TO THE TRIPLE POINT USING DATA FOR ELEVEN GASES AND THREE METALS Final Technical Note
Robert D. Goodwin and Lloyd A. Weber 6 Oct. 1963 28 p refs Previously announced as N64-14291
(COM-75-10052/9; NBS-TN-183) Avail: NTIS HC $3.75 CSCL 07D

Parameters were determined by a least-squares method for the reduced Simon equation and for a new, empirical melting equation using data for H2, D2, T2, Ne, Ar, Kr, Xe, N2, O2, H2O, Na, K, and Hg. The new equation, $(P-P(+))/(T-T(+))=A\exp(-(alpha)/T)+BT$, represents experimental data with essentially the same accuracy as the Simon equation. It provides a sensitive difference method for graphical examination of data. GRA

N75-21399# Pennsylvania State Univ., University Park. Applied Research Lab.
CRITICAL HEAT FLUXES FOR CURVED AND STRAIGHT SURFACES DURING SUB COOLED FLOW BOILING Ph.D. Thesis
Thomas G. Hughes 7 Jun. 1974 161 p refs
(Contract N00017-73-C-1418)
(AD-A003036; TM-74-194) Avail: NTIS CSCL 07/4

Experimental and analytical studies of the critical heat flux for subcooled flows of Freon 113 over concave, convex and straight surfaces have been conducted. Correlation functions for the critical heat flux on each surface have been developed from an idealized model of the vapor bubble cycle in nucleate boiling. These functions have been evaluated and compared with data collected in an experimental apparatus, constructed as part of this investigation. Details of the apparatus design and operating procedures are given. GRA

N75-21400# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DOMESTICATION OF FLUORINE
I. Knunyants 25 Nov. 1974 12 p Transl. into ENGLISH from Izv. (USSR), no. 5, 27 Aug. 1974 p 5
(AD-A002832; FTD-HT-23-122-75) Avail: NTIS CSCL 07/3

The report briefly discusses the development of the chemistry and properties of organic fluorine compounds and polymers. GRA

N75-21401# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TURBULENT COMBUSTION OF GASES OUTLINE OF THE CONTEMPORARY STATE OF THE THEORY
L. A. Vulis 13 Nov. 1974 25 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 265-275
(AD-A002895; FTD-MT-24-1905-74) Avail: NTIS CSCL 21/2

The interest in turbulent combustion of gases is reported showing its importance in technology and the general theory of combustion. The aerodynamic theory of a flame is discussed along with the average characteristics of reactions. M.C.F.

N75-21402# Naval Research Lab., Washington, D.C.
TWO PHOTON RESONANTLY ENHANCED SELF-DEFOCUSING IN Cs VAPOR AT 1.06 MICRON
R. H. Lehmberg, J. Reintjes, and R. C. Eckardt Nov. 1974 23 p refs
(NRL Proj. 55N01-43)
(AD-A002944; NRL-MR-2932) Avail: NTIS CSCL 07/4

The electronic nonlinear refractive index in Cs vapor at 1.06 micrometers is shown to be negative and to consist of two distinct contributions. One of these contributions arises from a two photon resonance in the susceptibility, and can be made comparable to magnitude to the positive n2 in laser glass. The other term arises from population redistribution between the ground and the first excited state. Preliminary measurements of self defocusing of a single pulse from a Nd:YAG mode locked laser are presented which are in agreement with the theoretical predictions. GRA

N75-21403# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF DETERMINING ERROR IN CALCULATED PARAMETERS OF COMBUSTION PROCESS RESULTING FROM ERROR IN THERMODYNAMIC PROPERTIES OF INDIVIDUAL SUBSTANCES
V. E. Alemasov 19 Nov. 1974 12 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd-vo Nauka, 1972 p 435-438
(AD-A002917; FTD-HT-23-1939-74) Avail: NTIS CSCL 21/2

Thermodynamic calculation is broadly used to determine the parameters of the combustion process. Error in any parameter of the process, determined as a result of thermodynamic calculation, depends on: (a) the mathematical error of the calculation method; (b) error in the original data on the fuel (enthalpy and elementary composition of the fuel); (c) error from reference data on properties of individual substances components of combustion products (enthalpy Iq, entropy Sq, and other properties of q-th substance). Studied in the work is the effect of error from reference data on the properties of individual substances. GRA

N75-21404*# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROPAGATION OF A FLAME IN A MIXTURE OF GAS AND PARTICLES
R. I. Nigmatulin and P. B. Vainstein 18 Nov. 1974 12 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 182-185
(AD-A002965; FTD-HT-23-1870-74) Avail: NTIS CSCL 21/2

General equations of motion are discussed for a mixture of a gas and particles whose combustion occurs in one of three limiting regimes. The temperature change in the gas and particles for a purely heterogeneous combustion regime is reported. M.C.F.

N75-21405# California Univ., La Jolla. Dept. of Physics.
DENSITY FUNCTIONAL THEORY OF CHEMISORPTION ON METAL SURFACES
Walter Kohn, S. C. Ying, and J. R. Smith Dec. 1974 48 p refs
(Contract N00014-69-A-0200-6026; NR Proj. 017-653)
(AD-A003001; TR-28) Avail: NTIS CSCL 07/4

The density functional theory of chemisorption is developed by means of a self-consistent linear response formalism. Any chemisorbed species which can be represented as an external charge distribution perturbing the metallic surface can be studied with this approach. The formalism is applied to hydrogen chemisorbed on a tungsten surface. Theoretical results for the ionic desorption energy, adatom vibrational frequency, relative size of the dipole moment, resonance levels associated with the adsorbate, and the question of dissociation agree well with experimental measurements. The calculated level width is too large. Differential scattering cross sections for chemisorbed hydrogen are compared with those of the isolated atom. The rather satisfactory overall agreement of our theory with experimental results suggests that the linear response formalism may have a wider usefulness. GRA

N75-21406# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF ELECTROSTATIC TREATMENT OF FUEL-AIR MIXTURE ON FLAME PROPAGATION RATE
A. U. Salimov and M. T. Balabekov 19 Nov. 1974 16 p Transl. into ENGLISH from Nauch. Tr. Tashkent. Politekhn. In-Ta (USSR), no. 82, part 1, 1971 p 136-145
(AD-A003042; FTD-MT-24-1245-74) Avail: NTIS CSCL 21/2

The kinetic characteristics of the combustion process of homogeneous fuel-air mixtures were investigated. The following factors effecting the rate of displacement of the flame front in tubes were studied: rate of heat transfer from flame front to fresh mixture; diffusion of active centers from combustion zone to fresh mixture; and photocatalytic effect of flame radiation to the reactants. Photoelectric multipliers were used to measure the flame velocity in ducts. Experimental results indicate that electrostatic preparation of fuel-air mixtures increases the flame propagation rate. Results are discussed. J.M.S.

N75-21407# Army Foreign Science and Technology Center, Charlottesville, Va.
POLAROGRAPHY OF SOLID ELECTRODES
Yu. Delimarskii 3 Apr. 1974 85 p Transl. into ENGLISH from the book "Polyaografiya na Tverdykk Elektrodakh" Kiev, Teckhnika Press, 1970 p 6-37, 178-204
(AD-A002764; FSTC-HT-23-1307-73) Avail: NTIS CSCL 07/4

The kinetics of polarization processes at solid electrodes is presented. Discussed is equilibrium potential at the electrode-electrolyte interface, concentration polarization, convective diffusion, nonsteady diffusion, and so on. The second part deals with the polarography of molten salts. Indicating electrode and second working electrode selection is discussed. Derivative polarography of salt melts is treated, along with the anodic polarography of ionic melts, and the oscillographic polarography of ionic melts. GRA

N75-21408# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON TYE COMBUSTION OF A SUSPENSION WITH SMALL CONCENTRATIONS OF THE SOLID PHASE
R. A. Barlas 18 Nov. 1974 12 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Nauka, 1972 p 171-174
(AD-A003043; FTD-HT-23-1868-74) Avail: NTIS CSCL 21/2

The authors examine the steady-state burning of a suspension - a limitless two-dimensional flame front moves parallel to itself in a quiescent dust cloud by introducing a mobile system of equations related to both the flame front and the reference point, the axis x, which is directed toward the flame. In this coordinate system the flame front is stationary, while the suspension moves at a certain rate v. GRA

N75-21409# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF THE CHARGING OF PARTICLES 0.2-4 MICROMETERS IN DIMENSION BY IONS OF AIR
L. M. Makalskii and G. Z. Mirzabekyan 20 Nov. 1974 22 p refs Transl. into ENGLISH from Silnye Elektr. Polya Tekhnol. Protsessakh Elektronno-Tonnaya Tekhn. Sb. Statei (Moscow), no. 2, 1971 p 95-108
(AD-A003084) Avail: NTIS CSCL 07/4

For the charging of particles with diameters from 0.2-4.0 micrometers by ions of air, it is necessary to consider simultaneously both mechanisms of the charging; namely, the action of the external electric field, and diffusion. The reported research concerns the experimental checking of the law of the charging of particles under conditions of the obtaining by them of charges close to the maximum and at values of the electric field strength characteristic for installations of electron-ion technology. GRA

N75-21410# Maine Univ., Orono. Dept. of Chemical Engineering.
RATE OF MASS TRANSFER OF GAS TO AQUEOUS ELECTROLYTE SOLUTIONS. PART 4: AN INVESTIGATION OF OXYGEN TRANSFER RATES TO FLOWING FILMS OF VARIOUS ELECTROLYTE SOLUTIONS Interim Report, Sep. 1972 - Dec. 1974
Dale R. Raymond and Stefan N. Zieminski Dec. 1974 54 p refs
(Grant NSF GK-30858)
(PB-238645/6; UM-CE-74-04-Pt-4) Avail: NTIS HC $4.25 CSCL 07D

The mass transfer coefficient has been measured for solutions of K2SO4, (NH4)2SO4, Na2SO4, MgSO4, Al2(SO4)3, NaCl, and AlCl3 under conditions of nearly horizontal, thin, essentially laminar, flowing films. An equipment design and procedure was developed for producing these films with very well-defined, measurable surface areas. The dissolved oxygen accumulation in the bulk was continuously monitored. The resulting values of the mass transfer coefficient were compared with published entropies of hydration and discussed in light of the above implications. The results show that although the entropy of hydration has a strong influence on the changes in the mass transfer coefficient, it does not have a linear relationship. GRA

N75-21411# Bureau of Mines, Amarillo, Tex. Helium Div.
ANALYSES OF NATURAL GASES Information Circular
B. J. Moore Nov. 1974 101 p
(PB-238125/9; BM-IC-8658) Avail: NTIS MF $2.25; SOD HC $1.65 as I28.27:8658 CSCL 21D

This publication contains routine analyses and related source data for 278 natural gas samples from 14 states. All samples were collected during calendar year 1973 as a part of a continuous survey of the free world for occurrences of helium. GRA

N75-21412# Factory Mutual Research Corp., Norwood, Mass.
DYNAMICS OF TEXTILE FIRES Final Report, 1 Jul. 1972 - 30 Feb. 1974
G. H. Markstein and J. DeRis Mar. 1974 57 p
(Contract NBS-C-2-36011)
(COM-75-10128/7; NBS-GCR-75-34) Avail: NTIS HC $4.25 CSCL 13L

The report is concerned with fire spread rates over the surface and along the edge of textile fabrics and their controlling mechanisms. In a previous study, upward two-dimensional turbulent fire spread was investigated using sidewalls to prevent sideways air entrainment. This resulted in a continuously accelerating flame spread over heights of practical interest. In the present study, three dimensional flow was permitted by eliminating the side walls. The resultant flame spread becomes steady soon after ignition. GRA

N75-21413# National Bureau of Standards, Washington, D.C. Programmatic Center for Fire Research.
GASOLINE AND GASOLINE CONTAINER FIRE INCIDENTS Final Technical Note
Elaine A. Tyrrell Jan. 1975 35 p refs
(COM-75-50073/6; NBS-TN-850) Avail: NTIS MF $2.25; SOD HC available as C13.46:850 CSCL 21D

Gasoline was involved in 72 percent of the 645 volatile flammable liquids fire incidents found in the NBS Flammable Fabrics Accident Case and Testing System as of December 1973. Container-related gasoline incidents were studied in detail. Children were injured most from knocking over or dropping a container of gasoline close to an ignition source and playing with gasoline and an ignition source. Matches were the most frequent ignition source. Containers ranged from large gasoline cans to kitchen measuring cups, although gasoline cans were reported most often. The problem was one of human error - misuse or abuse of the gasoline, the container, or both. GRA

N75-21414# British Steel Corp., Sheffield (England). Information Services.
THE DETERMINATION OF SILVER IN IRON AND STEELS BY ATOMIC ABSORPTION
M. E. Hofton Dec. 1974 8 p
(PB-238807/2; GS/TECH/558/1/74/C) Avail: NTIS HC $3.25 CSCL 11F

A method is described for the determination of trace amounts of silver in a variety of iron and steel alloys. The procedure, by atomic absorption spectrophotometry, is rapid, precise, and free from interference enabling the direct determination of silver in the range 0 to 0.02%. The sample solution prepared for the determination of silver may also be used to determine other metals by atomic absorption. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-21415 British Library Lending Div., Boston Spa (England).
PROPERTIES AND APPLICATION OF EP670 HIGH-TEMPERATURE CORROSION RESISTANT ALLOY
F. L Levin et al 1974 18 p Transl. into ENGLISH from Stal (USSR), no. 7, 1974 p 643-647 In RUSSIAN and ENGLISH (BLL-M-25032-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.. 2 BLL photocopy coupons

The low carbon austenitic alloy EP670 has a number of advantages over the EP629 alloy. The hot working temperature range in which this alloy exhibits maximum processing ductility

(1200-900 C) was determined from commercial casts produced in induction furnaces. The alloy can be successfully cold rolled (in tube production). A good combination of properties can be obtained by hardening from 1100-1130 C. The alloy's chemical composition ensures adequate stability of its structure and properties at high temperatures. The alloy, as produced to standard composition, has a high rupture strength at 750-850 C and a satisfactory resistance to oxidation and corrosion at 800 C. At temperatures of 650 C and above, the alloy shows no susceptibility to intergranular corrosion after 5000 hours. Information is given on industrial production practice and on typical applications of the rolled products in chemical and oil drilling plant construction. Author

N75-21416 British Library Lending Div., Boston Spa (England).
CHANGE IN THE CONSTANT OF INDUCED ANISOTROPY AND MAGNETIZATION OF 50N ALLOY
V. I. Solodikhin, I. V. Sidash, and Yu. A. Birman 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 7, 1974 p 124-130 In RUSSIAN and ENGLISH
(BLL-M-25043-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The constant of induced magnetic anisotropy and saturation magnetization is studied in relation to heat and magnetic treatment conditions. Kinetic curves show that the manner in which these quantities alter is not steady. The results are discussed from the point of view of the impurity mechanism of heat and magnetic treatment. Author

N75-21417 Polytechnic Inst. of New York.
METASTABILITY AND PHASE TRANSFORMATIONS IN SPLAT COOLED Ni-Al AND Ag-Mg ALLOYS Ph.D. Thesis
Muthuswamy Chandrasekaran 1974 203 p
Avail: Univ. Microfilms Order No. 74-22461

The morphology and crystallography of martensites occurring in splat cooled Ni-Al and Ag-Mg alloys have been studied. Ni-Al alloys and Ag-Mg alloys were liquid quenched to room temperature, using a modified gun technique. Anomalous contrast and diffraction effects have been observed in retained beta phases of splat cooled Ni-Al and Ag-Mg alloys. These anomalous effects have been traced to the instability of the beta phase due to short wavelength lattice vibration modes and to fine scale coherent precipitates. A diffusionless martensitic transformation has been observed in the Ag-Mg system for the first time. Martensites with close packed structures have been observed in splat cooled Ag-43/1 and Ag-46.6 at % Mg alloys. Dissert. Abstr.

N75-21418 Lehigh Univ., Bethlehem, Pa.
GASEOUS HYDROGEN EMBRITTLEMENT OF HIGH STRENGTH STEEL Ph.D. Thesis
Richard Paul Gangloff 1974 281 p
Avail: Univ. Microfilms Order No. 75-4724

Hydrogen assisted crack growth in 18Ni maraging steels was characterized by an apparent threshold stress intensity for crack growth (Kth), a domain where the growth rate increased sharply sub with K (Stage I), and a range where growth was independent of the mechanical driving force (Stage II). Increased yield strength increased susceptibility to gaseoous hydrogen embrittlement. Dissert. Abstr.

N75-21419 Florida Univ., Gainesville.
THE RETARDATION OF CRACK PROPAGATION FOR HIGH STRENGTH, LOW ALLOY STEELS IN AQUEOUS MEDIA BY ADDITION OF OXIDIZING INHIBITORS Ph.D. Thesis
Phillip A. Parrish 1974 180 p
Avail: Univ. Microfilms Order No. 75-3518

Oxidizing inhibitors can be utilized to retard crack growth in high strength, low alloy martensitic steels in aqueous solution. Artificial crevice cell and crack tip pH measurements have shown that conditions favorable for hydrogen embrittlement of the steel exist in propagating cracks. Localized hydrogen measurements of the fracture surfaces of D6AC specimens which failed under tensile load in aqueous solution show that hydrogen was absorbed into the steel in the vicinity of the crack tip, and that, as proposed by Troiano, hydrogen migrated through the lattice to the region of highest triaxial stress and was trapped in the strained lattice. Hydrazine was effective in reducing the crack growth rate by one order of magnitude for D6AC in aqueous solution. Dissert. Abstr.

N75-21420 California Univ., Los Angeles.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF Cr-Mo STEELS Ph.D. Thesis
Pedro Armengo Chalco 1974 274 p
Avail: Univ. Microfilms Order No. 75-1973

The correlation between microstructure as a function of carbon content and heat treatment and mechanical properties of 2-1/4Cr-1Mo steels was studied using three 2-1/4Cr-1Mo steels of different carbon content. The microstructural studies included: Optical metallography, thin-film TEM and X-ray diffraction of extracted residues. The evaluation of mechanical properties included room temperature tensile testing and creep testing at 850 - 1050F. Dissert. Abstr.

N75-21421 Washington Univ., Seattle.
A STUDY OF THE MECHANICAL BEHAVIOR OF POLYCRYSTALLINE ZIRCONIUM CARBIDE AND ZrC + B ALLOYS AT ELEVATED TEMPERATURES Ph.D. Thesis
Ramgopal Darolia 1974 205 p
Avail: Univ. Microfilms Order No. 75-3966

The compressive deformation behavior of 100% dense polycrystalline zirconium carbide has been studied at various strain rates and temperatures in the range 1000 C - 1800 C. Also, the deformation behavior of zirconium carbide alloyed with up to 3.0 wt% boron has been investigated. The rate controlling deformation mechanism has been identified by means of a study of the variation of the compressive yield stress with temperature. Thermally activated deformation parameters such as the activation energy, the activation volume, and the strain rate sensitivity have been calculated. Stress relaxation and strain recovery behavior for both ZrC and ZrC + B alloys are also presented. Serrated yielding has been observed and is discussed in terms of dynamic recrystallization. Dissert. Abstr.

N75-21422 Virginia Univ., Charlottesville.
INVESTIGATION OF SUPERPLASTICITY IN THE Zn-Al EUTECTOID AND THE Mg-Al EUTECTIC Ph.D. Thesis
Glenn Wayne Franti 1974 176 p
Avail: Univ. Microfilms Order No. 75-2068

Superplastic deformation in the Zn-Al eutectoid and the Mg-Al eutectic alloys are studied using constant strain rate tensile testing. Samples from both alloys were heat treated to yield various grain sizes. Tensile testing was performed at elevated temperatures and at constant strain rates. Specimens for transmission electron microscopy were prepared from these samples after deformation. The true stress-true strain curves for the Zn-Al eutectoid revealed three distinct modes of deformation: strain-softening, a steady state, or a strain hardening mode, depending on grain size and strain rate. Samples of the Mg-Al eutectic exhibited strain hardening at all strain rates. These results are in contrast to the deformation behavior observed in constant crosshead speed testing where the majority of cases report only strain softening. Dissert. Abstr.

N75-21423 Illinois Univ., Chicago.
APPLICATION OF WEIGHTED RESIDUAL METHODS TO METAL DEFORMATION PROCESSING Ph.D. Thesis
Jaw-Shyong Lan 1974 134 p
Avail: Univ. Microfilms Order No. 74-27784

The method of weighted residuals is used to study the flow behavior in metal forming processes. The Levy-von Mises constitutive equations are used in the formulation to describe the assumed rigid plastic material behavior. The configuration of the final deformed shape is obtained through a time incrementization process. Numerical computations are carried out for the problem of the upsetting of a right circular cylinder between two rigid platens. Either a rough (zero radial velocity) or a sliding (constant shear stress) contact is assumed to exist at the cylinder platen interface. Results indicate that useful information regarding the stress and flow description can be obtained. A comparison of the results from using different series expansions shows that the method is however sensitive to the choice of the series expansion. Dissert. Abstr.

N75-21424 Mississippi State Univ., State College.
THEORETICAL TREATMENT OF STRESSES AND STRAINS INDUCED IN A MATRIX BY INCLUSIONS Ph.D. Thesis
Edward Joseph Anderle 1974 55 p
Avail: Univ. Microfilms Order No. 75-4185

These inclusions may be deliberately introduced as in dispersion hardened alloys, or accidentally introduced, as in dirty steels and aluminum with slag inclusions. The stresses and strains may be theoretically claculated assuming that the inclusions are incompressible and that they are randomly distributed. The assumption is also taken that all inclusions except the one nearest the point in question are point sources of expansion. Inclusions such as those found in dispersion-hardened materials and dirty steels are approximated as spherical in shape, while those such as fibers in fiber reinforced composites are approximated as cylindrical in shape. The inclusion is an important factor in the process of crack initiations. Dissert. Abstr.

N75-21425 New York State Univ., Albany.
NUCLEAR MAGNETIC RESONANCE STUDY OF SODIUM BETA-ALUMINA Ph.D. Thesis
Intaik Chung 1974 128 p
Avail: Univ. Microfilms Order No. 75-2341

Sodium beta-alumina is a solid ionic conductor with an exceptionally high ionic conductivity at room temperature and above, with the sodium ions as the conducting species. The non-stoichiometric structure of the system involves excess sodium ions, and defects. X-ray and neutron diffraction studies show sodium ions at several different crystallographic sites. The present wide-line nuclear magnetic resonance (NMR) study has provided information on this material. NMR spectra for single crystals were obtained at 4.0 to approximately 19.0 MHz Larmor frequency at temperatures between -186 and +220 C. Rotation patterns of pure sodium beta-alumina single crystals were analyzed for the quadrupole coupling constant and the asymmetry parameter to the electric field gradient tensor at sodium ions. At temperatures between -136 and +125 C the coupling constant remained unchanged, and the asymmetry parameter varied from 1.29 to 0.16. Dissert. Abstr.

N75-21426 Cincinnati Univ., Ohio.
LOW CYCLE FATIGUE AND FATIGUE CRACK PROPAGATION IN A SERIES OF COPPER RICH COPPER ALUMINUM ALLOYS Ph.D. Thesis
Ashok Saxena 1974 122 p
Avail: Univ. Microfilms Order No. 75-2550

Low cycle fatigue on smooth hour glass specimens and fatigue crack propagation studies on single edge notch specimens were carried out on four Cu-Al polycrystalline alloys to investigate the effect of stacking fault energy, tensile strength and ductility on fatigue mechanisms. Lowering the SFE, which promotes planar slip, resulted in large improvements in fatigue properties. It was observed that planar slip was associated with a less than a second power dependence of plastic zone size on the stress intensity range. Transmission electron microscopy was used to observe the substructures that developed both in LCF at different strain ranges and also ahead of fatigue cracks at different stress intensity ranges. Fractography by electron replication technique was carried out to study the micro-mechanisms of crack propagation. Dissert. Abstr.

N75-21427 Denver Univ., Colo.
THERMOMECHANICAL PROCESSING OF A NICKEL-BASE SUPERALLOY BY COLD-ROLLING AND SHOCK-WAVE DEFORMATION Ph.D. Thesis
Marcos Andre Meyers 1974 234 p
Avail: Univ. Microfilms Order No. 75-4182

The potential of thermomechanical processing of Inconel 718 by shock wave deformation was assessed by subjecting it to pressures up to 510 Kbar in the solution treated condition and applying the two standard heat treatments. The introduction of a pre-deformation aging treatment promoted a further increase in strength. The pre- and post-deformation agings were optimized. A systematic determination of long- and short-term tensile properties of the optimized schedule was conducted. The results are interpreted in terms of grain morphology, deformation substructure, precipitate morphology and distribution annealing response, thermal stability, work hardening and fracture characteristics. Dissert. Abstr.

N75-21428 Cincinnati Univ., Ohio.
ON THE THEORY OF METAL/ELECTROLYTE POLARIZATION AS APPLIED TO NICKEL PASSIVATION Ph.D. Thesis
Adolf Pigeaud 1974 134 p
Avail: Univ. Microfilms Order No. 75-2549

The theory which describes the metal surface reactions occurring in an electrolyte environment that can lead to passive oxide-film formation at ambient temperature is investigated. Anodic current conduction during surface oxidation is related to the immigration of mass and electron defects in a layered structure of superimposed metal oxide phases. These phases are formed from an initially precipitated 'hydrogel' and grow and dissolve through movement of the phase boundaries between them which remain parallel to the original metal surface. A method of writing combined solid state/chemical equations is developed to illustrate such phase boundary reactions. An equivalent resistance-capacitance analog circuit is formulated to described the electrical behavior of such a layered semiconductor structure. An analytical model for the progressive polarization of metal/electrolyte interfaces is presented which begins with the precipitation of a hydroxide layer at the surface. The model is confirmed with respect to the electrical and the visual phenomena observed during polarization by data obtained on a pure nickel-sulfuric acid system. The similarities which exist between ambient temperature-aqueous oxidation and high temperature-gaseous oxidation are illustrated. Dissert. Abstr.

N75-21429 Temple Univ., Philadelphia, Pa.
ANOMALOUS BEHAVIOR IN SPECIFIC HEAT AND RESISTIVITY PROPERTIES OF BINARY AND TERNARY ALLOY SYSTEMS NEAR THEIR ORDER-DISORDER TRANSITION TEMPERATURES Ph.D. Thesis
Vastaray K. Prasanna Kumar 1973 151 p
Avail: Univ. Microfilms Order No. 74-28236

Specific heat as a function of composition of beta-brass, as also, specific heat and resistivity of the stoichiometric ternary alloys AuCuZn2 and AgAuZn2 were determined as a function of temperature. In the case of ternaries, there is a clear anomaly in the specific heat of AuCuZn2, but it is not as much pronounced as in beta-brass. Also, the temperature derivative of resistivity did not have the same type of behavior as the specific heat, since the derivative reached a maximum near the singular region, attained a minimum about 7 deg after before increasing again. The alloy AgAuZn2 showed an even larger broadening in specific heat and resistivity. An analysis in terms of thermal expansion indicated that the anomaly was not entirely due to the thermal expansion. Dissert. Abstr.

N75-21430*# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
ALUMINUM UNDER HIGH PRESSURE: 1 EQUATION OF STATE
Carlos Friedli and N. W. Ashcroft [1975] 24 p
(Grant NGR-33-010-180)
(NASA-CR-142617; Rept-6) Avail: NTIS HC $3.25 CSCL 11F

A curve of applied pressure P versus lattice constant a is calculated for single crystal aluminum. It results from an application of the method of structural expansions for deriving the energies of simple metals, a method known to give reasonable results for the elastic constants even at second order in the effective electron-ion interaction. The method is taken from Fermi surface analysis. This essentially experimental information is used to verify that the extant face-centered cubic structure remains the preferred crystalline phase up to the highest pressures considered. Arguments are given to suggest that the P versus a curve should have reasonable a priori accuracy, which may be improved if experimental data in the intermediate pressure region can be provided to refine the energy dependent pseudo-potential. At 3 megabars the lattice constant is reduced by only 22%; the ion cores at this pressure are still very well separated. Author

N75-21431*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

PREDICTION AND VERIFICATION OF CREEP BEHAVIOR IN METALLIC MATERIALS AND COMPONENTS, FOR THE SPACE SHUTTLE THERMAL PROTECTION SYSTEM. VOLUME 1, PHASE 1: CYCLIC MATERIALS CREEP PREDICTIONS

J. W. Davis and B. A. Cramer Nov. 1974 453 p refs
(Contract NAS1-11774)
(NASA-CR-132605-1) Avail: NTIS HC $11.50 CSCL 11F

Cyclic creep response was investigated and design methods applicable to thermal protection system structures were developed. The steady-state (constant temperature and load) and cyclic creep response characteristics of four alloys were studied. Steady-state creep data were gathered through a literature survey to establish reference data bases. These data bases were used to develop empirical equations describing creep as a function of time, temperature, and stress and as a basis of comparison for test data. Steady-state creep tests and tensile cyclic tests were conducted. The following factors were investigated: material thickness and rolling direction; material cyclic creep response under varying loads and temperatures; constant stress and temperature cycles representing flight conditions; changing stresses present in a creeping beam as a result of stress redistribution; and complex stress and temperature profiles representative of space shuttle orbiter trajectories. A computer program was written, applying creep hardening theories and empirical equations for creep, to aid in analysis of test data. Results are considered applicable to a variety of structures which are cyclicly exposed to creep producing thermal environments.
Author

N75-21432*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF TITANIUM, BORON AND MOLYBDENUM ON THE STRUCTURE OF AUSTENITIC 18/10 STEEL AFTER SOLUTION HEAT TREATMENT AND SENSITIZATION

Z. Bojarski, W. Czyrski, J. Eysmontt, and H. Serwicki Washington NASA 3 Mar. 1975 34 p refs Transl. into ENGLISH from Prace Inst. Hunticzych (USSR), v. 23, no. 1, 1971 p 9-23
(Contract NASw-2481)
(NASA-TT-F-16172) Avail: NTIS HC $3.75

Austenitic steels types OH18N9, IH18N10T, IH1810T+B and IH18N10MT manufactured in Poland and imported X10CrNiTi X10CrNiTi18.9 steel were investigated after solution heat treatment and annealing at 500, 650 and 750 C. The methods used were optical and electron microscopy, X-ray phase analysis and X-ray microanalysis. The following inclusions were observed in solution heat treated steels: in OH18N9 steel nonmetallic oxide and sulfide inclusions and in the remaining types of steels also carbide, titanium nitride and Ti4S2C2 inclusions. After the sensitizing treatment the M23C6 carbide was precipitated in OH18N9 steel M23C6. Observations show: M23C6 carbide and small amounts of the S phase in OH18N16T, 1H18N10T+B steel, the sigma phase and a small amount of M23C6 carbide in 1H18N10MT steel and only a small amount of the sigma phase in X10CrNiTi18.9 steel.
Author

N75-21433*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ENVIRONMENTAL CRACK-GROWTH BEHAVIOR OF HIGH STRENGTH PRESSURE VESSEL ALLOYS

Royce G. Forman Washington Apr. 1975 43 p refs
(NASA-TN-D-7952; JSC-S-423) Avail: NTIS HC $3.75 CSCL 11F

Results of sustained-load environmental crack growth threshold tests performed on six spacecraft pressure vessel alloys are presented. The alloys were Inconel 718, 6Al-4V titanium, A-286 steel, AM-350 stainless steel, cryoformed AISI 301 stainless steel; and cryoformed AISI 304L steel. The test environments for the program were air, pressurized gases of hydrogen, oxygen, nitrogen, and carbon dioxide, and liquid environments of distilled water, sea water, nitrogen tetroxide, hydrazine, aerozine 50, monomethyl hydrazine, and hydrogen peroxide. Surface flaw type specimens were used with flaws located in both base metal and weld metal.
Author

N75-21434*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
KINETIC STUDIES OF THE STRESS CORROSION CRACKING OF D6AC STEEL

Pascal J. Noronha 25 Mar. 1975 27 p refs
(NASA-TM-X-64923) Avail: NTIS HC $3.75 CSCL 11F

The effect of load interactions on the crack growth velocity of D6AC steel under stress corrosion cracking conditions was determined. The environment was a 3.5 percent salt solution. The modified-wedge opening load specimens were fatigue precracked and subjected to a deadweight loading in creep machines. The effects of load shedding on incubation times and crack growth rates were measured using high-sensitivity compliance measurement techniques. Load shedding results in an incubation time, the length of which depends on the amount of load shed and the baseline stress intensity. The sequence of unloading the specimen also controls the subsequent incubation period. The incubation period is shorter when load shedding passes through zero load than when it does not if the specimen initially had the same baseline stress intensity. The crack growth rates following the incubation period are also different from the steady-state crack growth rate at the operating stress intensity. These data show that the susceptibility of this alloy system to stress corrosion cracking depends on the plane-strain fracture toughness and on the yield strength of the material.
Author

N75-21435# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
DISLOCATION-SOLUTE ATOM INTERACTIONS IN ALLOYS Technical Progress Report, 1 Feb. 1974 - 31 Jan. 1975

R. Gibala, V. K. Sethi, and A. A. Sagues 31 Oct. 1974 22 p refs
(Contract AT(11-1)-1676)
(COO-1676-34) Avail: NTIS HC $3.25

Several results were obtained on two projects: effects of solute distribution on mechanical behavior of bcc metals, and mechanical behavior of hydrogenated bcc metals. Emphasis was on refractory metals and mainly on Nb. Results include: (1) observation of a strengthening effect of approximately 15 to 30% from inhomogeneous distribution of oxygen in Nb-O alloys, (2) observation of oxide film softening and hardening of high purity Nb at 77 and 300 K, respectively, (3) determination of effects of higher temperature prestrain on the strength of Nb at 77 K, (4) additional characterization of solid solution strengthening of Nb by O, and (5) determination of effects of purity and oxygen content on hydrogen strengthening and embrittlement of Nb.
Author (NSA)

N75-21436# Ames Lab., Iowa.
COMPILATION OF EXPERIMENTAL WORK ON THERMAL EMITTANCES OF MATERIALS. PART 3: ALLOYS

D. N. Baria and R. G. Bautista Nov. 1974 204 p refs
(Contract W-7405-eng-82)
(IS-3346-Pt-3) Avail: NTIS HC $7.25

A compilation of the experimental work on thermal emittances of alloys reported in the literature through 1972 are presented along with a brief review of the various experimental methods available for thermal emittance determinations.
Author (NSA)

N75-21437# Academia R. P. R., Bucharest.
DETERMINATION OF OXYGEN CONCENTRATIONS IN METALS BY ACTIVATION WITH 14 MeV NEUTRONS

I. Racataian, C. Postelnicu, G. Mociornita, L. Biciolla, and G. Brezeanu 1974 12 p In ROMANIAN
(IFA-RT-5-1974) Avail: ERDA Depository Libraries HC $4.00

A method for the continuous determination of oxygen in steel using neutron activation is described. The principles of the method are outlined and the experimental apparatus is described. The values obtained for various types of steel are analyzed to evaluate the performance of the measurement installation.
NSA

N75-21438# California Univ., Berkeley. Lawrence Berkeley Lab.
KINETICS OF AUTO-TEMPERING IN SELECTED PLAIN CARBON AND ALLOY STEELS M.S. Thesis

P. H. Zajchowski Aug. 1974 56 p refs
(Contract W-7405-eng-48)
(LBL-3121) Avail: NTIS HC $4.25

The kinetics of auto-tempering were studied in five steels--

AISI 1090, AISI 1046, AISI 4340, AMS 6416 (300-M), and modified 4340 + 3% Si at six tempering temperatures, 100, 150, 180, 240, 270, and 300 C by an electrical resistance method. With increasing isothermal tempering temperatures (100 to 300 C) the effects of the alloying elements, upon the tempering rate, became progressively greater. Silicon was observed to retard the tempering rate with increasing tempering time at a fixed temperature. Also, the ductility of steels tempered at 180 C was found to increase with tempering time and to decrease with increasing silicon content. Author (NSA)

N75-21439# California Univ., Berkeley. Lawrence Berkeley Lab.
INVESTIGATION OF BAINITE TRANSFORMATION IN MEDIUM CARBON LOW ALLOY STEELS M.S. Thesis
B. N. P. Babu Aug. 1974 151 p refs
(Contract W-7405-eng-48)
(LBL-2772) Avail: NTIS HC $6.25

The effects of small additions of common alloying elements (C, Ni, Cr, Mn, Mo and Si) on the kinetics of the bainite reaction in 4340 steel were studied, using a rapid magnetic permeability method and an automatic continuous recording to follow the austenite decomposition. Computer aided methods were used to analyze the isothermal reaction data and to plot the time-temperature-transformation diagrams. An acceleration of the bainite reaction just above the Ms temperature gave an S-shaped curve for the bainite reaction in all the steels studied. In some of the steels, separate C-curves for the upper and lower bainite were observed in the initial stages of transformation, but these overlapped in the latter stages. All the alloy additions except Mo increased the incubation times for bainite reaction. All the alloying elements except Mo shifted the bainite curves to longer times and lowered the kinetic Bs and Bf temperatures. Molybdenum, when added alone, accelerated the bainite reaction and raised the Bs and Ms temperatures, but when added together with Ni or Cr, retarded the bainite reaction. NSA

N75-21440# Sandia Labs., Livermore, Calif.
HYDROGEN EMBRITTLEMENT AND THE IRON TITANIUM HYDRIDE ENERGY STORAGE SYSTEM
S. C. Keeton Nov. 1974 21 p refs
(Contract AT(29-1)-789)
(SAND-74-8218) Avail: NTIS HC $3.25

Potential hydrogen embrittlement problems in the Brookhaven iron titanium hydride energy storage system are discussed. Hydrogen pressure and temperature cycling, oxide reduction by FeTi, bubble and blister formation and slow crack growth are considered. The conclusions reached are that AISI 316 stainless steel can be used as the pressure vessel material, but it represents an over qualified material for this purpose. Most other 300-series stainless steels would be acceptable. However, some plain carbon steels might be adequate and would offer less expensive alternatives. Author (NSA)

N75-21441# Oak Ridge National Lab., Tenn.
DYNAMIC SUSCEPTIBILITY CALCULATIONS IN FERROMAGNETIC IRON
J. F. Cooke, J. W. Lynn, and H. L. Davis 1974 7 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Mat., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(Conf-741202-3) Avail: NTIS HC $3.25

Calculations of the low temperature dynamic susceptibility of ferromagnetic iron were carried out within the framework of an itinerant electron model. The formalism incorporates band and wave vector dependent matrix element effects and is essentially the same as that used in previous work on nickel. The spin wave dispersion curves calculated along the three principal symmetry directions are found to be in excellent agreement with neutron scattering experiments. In addition the calculations predict correctly the experimentally observed spin wave disappearance. These results indicate that low temperature spin waves in both nickel and iron can be adequately described in terms of an itinerant electron model without recourse to ad hoc assumptions about local moment behavior. Author (NSA)

N75-21442# Army Foreign Science and Technology Center, Charlottesville, Va.
METALLURGICAL FURNACES
V. A. Krivandin, N. G. Molchanov, and S. L. Solomentsev 29 Mar. 1974 8 p refs Transl. into ENGLISH from the book "Metallurgiya" Moscow, 1969 p 600-607, 306-307
(AD-A002643; FSTC-HT-23-1460-73) Avail: NTIS CSCL 11/2

Thirteen bibliographical references in the general area of refractory and ceramic materials for metallurgical furnaces is given. A long table is provided, containing ten thermophysical and mechanical properties of 28 refractory materials. GRA

N75-21443# Naval Research Lab., Washington, D.C.
KIC SIZE EFFECT STUDY ON TWO HIGH-STRENGTH STEELS USING NOTCHED BEND SPECIMENS Final Report
Fred R. Stonesifer Nov. 1974 17 p refs
(NASA Order C-54542-B; NRL Proj. 84F01-15)
(NASA-CR-142677; AD-A002730; NRL-MR-2929) Avail: NTIS HC $3.25 CSCL 11/6

Five methods are used to calculate plane strain fracture toughness (K sub Q) values for bend-specimens of various sizes from two high-strength steels. None of the methods appeared to satisfactorily predict valid stress intensity factor (K sub IC) values from specimens of sizes well below that required by E399 standard tests. GRA

N75-21444# General Electric Co., Schenectady, N.Y.
METALLIC COMPOSITES FORMED IN SITU BY REACTIONS IN THE SOLID STATE Final Technical Report, 1 Dec. 1973 - 19 Oct. 1974
James D. Livingston Oct. 1974 29 p refs
(Contract N00019-74-C-0130)
(AD-A003007; SRD-74-111) Avail: NTIS CSCL 11/6

The production of aligned two-phase composites by the directional control of solid-state phase transformations, particularly eutectoid decomposition is considered. Crystallographic relations are studied in the CuAl eutectoid by transmission electron microscopy and diffraction. Of the various eutectoid alloys aligned CoSi is identified as having the greatest potential for possible structural use at elevated temperatures. The tensile behavior of CoSi is described from room temperature to 1100 C. Results of preliminary experiments on the effects of transition metal ternary alloying elements on the microstructure of CoSi eutectoid are presented. Recommendations for further study are given. GRA

N75-21445# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PLASMA-ARC REMELTING OF TITANIUM ALLOYS
E. I. Morozov and V. N. Karinskii 10 Dec. 1974 23 p refs Transl. into ENGLISH from Tsvetnye Metally (USSR), no. 1, 1973 p 53-55
(FTD Proj. T74-01-74)
(AD-A002806; FTD-MT-24-164-75) Avail: NTIS CSCL 11/6

Vacuum plasma-arc melting has the following advantages over vacuum arc melting with the consumable electrode: the possibility of the remelting of lump, noncompact charge; the possibility of the velocity control of melting, maintaining metal in the molten state and, therefore, its additional degassing; and, simpler vacuum equipment. Plasma-arc melting in vacuum (0.4-0.5 mm Hg.) has advantages over plasma-arc melting in weakly rarefied atmosphere (75-100 mm Hg.): the higher degree of degassing of melt, the higher thermal efficiency of process; the less consumption of working gas, and the possibility of using low-voltage current sources for vacuum arc furnaces. GRA

N75-21446# Johns Hopkins Univ., Baltimore, Md.
TECHNOLOGICAL PERSPECTIVES FROM TWO DECADES OF FUNDAMENTAL RESEARCH IN DYNAMIC PLASTICITY Final Report
James F. Bell Oct. 1974 105 p refs
(Contract DAAD05-70-C-0066)
(AD-A003175; BRL-CR-184) Avail: NTIS CSCL 11/6

The report presents twenty-five years of systematic study of the physics of large deformation and, in particular, of dynamic plasticity of metals. This work includes the results obtained for the loading and unloading response of the fully annealed solid, a general theory of plasticity, the dynamic plastic limit, the experimental study of dynamic plasticity and the evolution of proper constitutive equations. GRA

N75-21447# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CENTRIFUGE METHOD FOR PRODUCING METALLIC GRANULES AND THE PROSPECTS OF USING IT FOR OBTAINING HEAT-RESISTANCE TITANIUM ALLOYS
Y. F. Altunin, S. G. Glazunov, and O. P. Solonina 19 Nov. 1974 15 p refs Transl. into ENGLISH from Tekhnol. Legkikh Splavov (USSR), no. 2, 1970 p 120-126
(FTD Proj. T74-01-10A)
(AD-A002802; FTD-HT-23-0083-75) Avail: NTIS CSCL 11/6
An apparatus for the granulation of titanium alloys for subsequent hot pressing is produced and put into operation. The first composition materials are prepared and tested on the basis of granulated titanium alloys with high heat-resistant components. GRA

N75-21448# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORECAST OF DOUBLE CRYSTALLINE PHASES WITH A STRUCTURE OF THE CaCu5 TYPE BY MEANS OF A COMPUTER
E. M. Savitskii and V. B. Gribulya 19 Nov. 1974 11 p ref Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), 1974 p 1059-1062
(AD-A002801; FTD-HT-23-0075-75) Avail: NTIS CSCL 20/2
Computer forecasts of double crystalline phases of CaCu5 with lave phases are given in tabular form. The forecasts are based on electron structure of component atoms. E.H.W.

N75-21449# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
VISCOSITY OF METALS IN EXPLOSION WELDING
I. D. Zakharenko and V. I. Mali 19 Nov. 1974 13 p refs Transl. into ENGLISH from Gorenie i Vzryv (Moscow), 1972 p 572-578
(AD-A003095; FTD-HT-23-1992-74) Avail: NTIS CSCL 13/8
The glancing collisions of metal plates are reported showing two different phenomena may occur. The velocity of the contact point was measured in preliminary experiments by means of streak photography. M.C.F.

N75-21450# General Electric Co., Schenectady, N.Y. Advanced Technology Labs.
CRITICAL SURVEYS OF DATA SOURCES: MECHANICAL PROPERTIES OF METALS Final Report
R. B. Gavert, R. L. Moore, and J. H. Westbrook Sep. 1974 88 p
(Contract C-3-35883)
(COM-74-51060/3; NBS-SP-396-1; LC-74-8090) Avail: NTIS MF $2.25; SOD HC as C13.10:396-1 CSCL 11F
A detailed critical survey of the existent sources of mechanical property data for commercially available metals and alloys is provided. This survey was intended to assess the scope, assets and deficiencies of about forty of the most prominent sources of such information. There were included: handbooks and technical compilations, information centers, foreign information sources, zechnical societies, and trade associations. The initial listing of sources to be examined was prepared by the authors with the advice and assistance of a subcommittee of the Metals Properties Council. The aim was to restrict the survey to sources which actually had compilations of mechanical property data in some form. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-21451 Cincinnati Univ., Ohio.
EFFECTS OF THERMAL AND MECHANICAL VARIABLES ON THE VISCOELASTIC PROPERTIES OF RIGID POLYVINYLCHLORIDE Ph.D. Thesis
Emmitt Ray Harrell, Jr. 1974 294 p
Avail: Univ. Microfilms Order No. 75-2286
The effects of processing variables on the solid state properties of two poly (vinyl chloride) resins which differ in stereoregularity were studied. Thin film samples prepared by both solvent casting and compression molding were subjected to various thermal and thermal-mechanical histories. Characterizations of dynamic mechanical properties, tensile properties, crystallinity, thermal transitions, and densities were also performed. Four frequencies were covered, 3.5, 11, 35, and 110 Hz. Room temperature tensile property characterization of the engineering tensile strength and energy to fracture also was obtained at four constant rates of elongation. Three levels of crystallinity were developed by appropriate annealing treatments. The restrictions on segmental mobility imposed by crystallinity resulted in the reduction of the secondary beta transition, enhancement of the storage modulus, and a shifting of Tg to higher temperatures. Dissert. Abstr.

N75-21452 Cornell Univ., Ithaca, N.Y.
THE LOW TEMPERATURE THERMAL PROPERTIES OF GLASSES Ph.D. Thesis
Richard Burnite Stephens 1974 307 p
Avail: Univ. Microfilms Order No. 75-4269
Measurements on a wide range of glasses for 0.1 K smaller than T smaller than 1 K have shown that glasses have an intrinsic phonon scattering mechanism which produces low temperature conductivities. Multiple measurements of some materials have demonstrated the mechanism causing this phonon scattering to be completely insensitive to variations in the sample's purity, thermal history, hardness, and radiation damage. Measurements on a microcrystalline material suggest that the above properties are not limited to glasses, but are common to a much more general class of partially disordered materials.
Dissert. Abstr.

N75-21453 Ohio Univ., Athens.
A MORPHOLOGICAL ORIENTATION MODEL OF THE DYNAMIC MECHANICAL BEHAVIOR OF LINEAR CRYSTALLINE POLYMERS Ph.D. Thesis
Gary Alan Armstrong 1974 162 p
Copyright. Avail: Univ. Microfilms Order No. 75-3542
A simple model of polymer deformation is examined which is sensitive to crystallinity, crystal morphology and orientation. Forced-oscillation dynamic mechanical testing is the mode of deformation with which the model is tested because of the availability of experimental data in the literature and the sensitivity of such data to orientational and morphological effects. The basic theory presented is based upon an isochoric and homogeneous deformation of a solid polymer specimen. The deformation of the macroscopic morphological unit is assumed to be affine and restricted to the case of spherulitic morphology. The overall spherulite deformation is therefore modelled as a sphere-ellipse transformation. Dissert. Abstr.

N75-21454 Arizona Univ., Tucson.
PHOTO AND SEMI-CONDUCTING MATERIALS Ph.D. Thesis
Daniel Ming Chang 1974 95 p
Avail: Univ. Microfilms Order No. 75-4934
Photoconductive copolymers containing N-vinyl carbazole and electron acceptors such as beta hydroxyethyl 3,5-dinitro benzoate, beta (2,4-dinitro phenoxy) propionate, and p-chloranil were synthesized. The absorption spectra of these intramolecular charge-transfer complex polymers were reported. Water soluble or dispersible copolymers containing N-vinyl carbazole were also synthesized by copolymerization of N-vinyl carbazole and water soluble monomers such as sodium N-acryloyl sulfanilate, sodium p-styrene sulfonate, N,N,N-trimethyl-N(p-vinyl benzyl)ammonium chloride (TVBA), and N,N,N-triethyl-N-(2-(methacryloxy)-ethyl) ammonium iodide. Substituted 2-benzylidene-1,3-dithioles and their charge transfer complexes were synthesized. The IR, NMR, UV, visible, near IR and ESR spectra of these complexes were also reported. Dissert. Abstr.

N75-21455 Nevada Univ., Reno.
NUCLEATION AND EPITAXIAL GROWTH OF ICE CRYSTALS FROM THE VAPOR Ph.D. Thesis
Bernard Jeffrey Anderson 1974 170 p
Avail: Univ. Microfilms Order No. 75-5307
Ice crystal nucleation and growth from the vapor epitaxially on covellite (CuS) and silver iodide single crystal substrates were

investigated experimentally. Experiments were conducted between -5 C and -20 + or - 0.2 C at saturation ratios up to 125 + or - 0.1% over ice. Temperature and saturation ratio were controlled independently. Sorption nucleation occurs on these substrates at supersaturations below minimum values found by previous experimenters. There is a time delay of between 10 and 150 seconds before nucleation which is inversely proportional to the excess vapor density. On covellite the number of crystals which nucleate increases with increases of excess vapor density until water saturation. On silver iodide the number increases with time when nucleation sites are continually produced by the action of light on the substrate. Epitaxy occurs on the basal faces of both covellite and silver iodide substrates.
Dissert. Abstr.

N75-21456*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF MULTIFUNCTIONAL CROSSLINKING AGENTS ON THE THERMOMECHANICAL PROPERTIES OF POLYIMIDE FILMS
Peter Delvigs 1975 8 p refs Proposed for presentation at the Symp. Molecular Eng.: An Interface Between Polymer Chem. and Polymer Eng. at the 107th Meeting of the Am. Chem. Soc., Chicago, 24-29 Aug. 1975
(NASA-TM-X-71706) Avail: NTIS HC $3.25 CSCL 11I
Three polyfunctional amines were synthesized. Polyimide films containing varying amounts of the amine crosslinking agents were prepared. Their thermomechanical properties were compared with those of control film samples prepared from difunctional amines. The effect of crosslink density on isothermal weight loss, polymer softening, and glass transition temperature is discussed. Author

N75-21457# Army Foreign Science and Technology Center, Charlottesville, Va.
INORGANIC GLASS AND GLASS CRYSTAL MATERIALS. METHOD FOR THE DETERMINATION OF IMPACT STRENGTH AT 900 C
7 Nov. 1973 6 p refs Transl. into ENGLISH from Russian Standard, GOST 11067-64
(AD-A002642; FSTC-HT-23-1402-73; GOST11067-64) Avail: NTIS CSCL 11/2
The standard gives specifications for the impact strength testing of glass samples on impact testing machines at temperatures up to 900C. GRA

N75-21458# Battelle Columbus Labs., Ohio.
STRENGTH-SIZE RELATIONSHIPS IN CERAMIC MATERIALS: INVESTIGATION OF PYROCERAM 9606
G. K. Bansal, W. H. Duckworth, and D. E. Niesz Nov. 1974 38 p refs
(Contract N00014-73-C-0408; NR Proj. 032-541)
(AD-A003012; TR-3) Avail: NTIS CSCL 11/2
This research was directed to characterizing and explaining strength-size relationships exhibited by ceramic materials. Precise measurements of the strength of the commercial glass-ceramic, Corning's Pyroceram 9606, are reported. Fracture stresses in specimens differing in each linear dimension by a factor of five were measured at room temperature under carefully controlled cofditions which minimized subcritical crack growth. Data obtained were analyzed with the aid of fractographic examinations to determine applicability of various size-effect theories. Findings indicated validity of the spurious-effect theory, and that the strength of Pyroceram 9606 can be described adequately in terms of stress alone. Maximum tensile stress criteria for failure were determined. GRA

N75-21459# Naval Ordnance Lab., White Oak, Md.
TRANSITIONS IN PHENOLIC POLYMER
R. W. Warfield 5 Nov. 1974 21 p refs
(ZR0000101; RR0130201)
(AD-A003035; NOLTR-74-115) Avail: NTIS CSCL 20/12
A phenolic polymer has been polymerized under conditions which lead to a crack free solid casting and its compressibility, electrical resistivity and specific heat have been determined. A secondary transition was found by compressibility measurements at about 120C and its existence confirmed by resistivity and specific heat measurements. Based upon the experimental data it is estimated that a glass transition would occur in this polymer at about 325C if degradation did not occur. The secondary transition is discussed in terms of polymer structure. GRA

N75-21460# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRICAL PROPERTIES OF THE TRANSITION FORMS OF CARBON
T. M. Khrenkova and V. I. Kasatochkin 19 Nov. 1974 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR. Energ. Transp. (USSR), no. 1, 1963 p 85-88
(AD-A003102; FTD-MT-24-2521-74) Avail: NTIS CSCL 11/2
The electrical properties of the products of heat treatment of carbon materials are investigated and the connections of the electrical properties of the transition forms of carbon with the structure of the latter are formulated. The experimental data indicate the regular connection of electrical properties and atomic structure. The conclusion is that the transition forms of carbon are related to semiconductor materials. GRA

N75-21461# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRODUCTION OF POLYAMIDE FIBERS, CHAPTER 6
Z. A. Zazulina and A. A. Konkin 20 Nov. 1974 54 p Transl. into ENGLISH from the monograph "Osnovy Tekhnologii Khimicheskikh Volokon" Moscow, 1969 p 231-265
(AD-A002993; FTD-HC-23-2684-74) Avail: NTIS CSCL 07/3
The report discusses the production and properties of polyamides and polyamide fibers. Apparatus used in processing is also described. GRA

N75-21462# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY ON SHOCK POLARIZATION OF POLYMERS
E. Z. Novitskii, A. G. Ivanov, and N. P. Khokhlov 18 Nov. 1974 13 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 579-583
(AD-A002812; FTD-HT-23-1993-74) Avail: NTIS CSCL 07/4
To further study the physics of shock polarization processes comparative experiments were undertaken on a series of polymers and molding powders. With respect to structure all polymers are either linear heterogeneous-chain or carbon-chain. A polyamide resin has the greatest dipole moment value, polyethylene and polytetrafluoroethylene the least. GRA

N75-21463# National Center for Energy Management and Power, Philadelphia, Pa.
PLEXIGLAS DR THERMAL STABILITY TEST
Alan P. Saunders 14 Aug. 1972 7 p Prepared in cooperation with Towne School of Civil and Mechanical Engineering, Phila., Pa.
(Grant NSF GI-27976)
(PB-238580/5; NSF/RANN/SE/GI-27976/TR-72-4; NSF/RA/N-72-040) Avail: NTIS HC $3.25 CSCL 11I
Plexiglas DR (a Rohm and Haas extrudable methyl methacrylate) used as the inner sheet in a non-operating double-pane solar collector exposed to summer solar radiation suffers major distortions. This material is not suitable for use in this environment unless the collectors are shielded from the sun during collector shutdown. Author (GRA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-21464# Sandia Labs., Albuquerque, N.Mex.
COMPATIBILITY TESTING TECHNIQUES FOR GASLESS PYROTECHNICS
T. M. Massis, D. K. McCarthy, D. J. Gould, and B. D. McLaughlin 1974 26 p refs Presented at the Conf. on Compatibility of Energetic Mater. with Plastics and Additives, Dover, N. J., 3 Dec. 1974 Sponsored by ERDA

(SAND-74-5291; Conf-741204-1) Avail: NTIS HC $3.75

Several methods evaluate potential compatibility problems involving gasless pyrotechnic compositions. These two methods are scanning electron microscopy and electrochemical techniques (corrosion cell potentials and potentiokinetic sweep procedures). The use of these techniques to evaluate compatibility between pyrotechnics and structural materials is described. Author (NSA)

N75-21465# TRW Systems Group, Redondo Beach, Calif.
DEVELOPMENT OF A ZERO-G GAUGING SYSTEM, VOLUME 2 Final Report, Oct. 1973 - Jun. 1974
F. E. Bupp Sep. 1974 78 p
(Contract F04611-71-C-0010)
(AD-A001667; TRW-16740-6005-RU-00-Vol-2; AFRPL-TR-74-53-Vol-2) Avail: NTIS CSCL 21/9

A configuration of the nucleonic gauging system denoted the Flight Test Article, which is suitable to demonstrate gauging performance in a zero-g environment as provided by the Zero-G KC-135 aircraft flying a parabolic trajectory, was designed, fabricated, and delivered to NASA. The gauging system is projected to yield a total system accuracy of 0.25 percent of total tank capacity with a 1-second response time. This volume contains the drawings and schematic diagrams. GRA

N75-21466# TRW Systems Group, Redondo Beach, Calif.
DEVELOPMENT OF A ZERO-G GAUGING SYSTEM, VOLUME 3 Final Report, Oct. 1973 - Jun. 1974
F. E. Rupp Sep. 1974 37 p
(Contract F04611-71-C-0010)
(AD-A001668; TRW-16740-6005-RU-00-Vol-3; AFRPL-TR-74-53-Vol-3) Avail: NTIS CSCL 20/9

Contents include the following: flight tests, general system description, test objective description, assembly and installation, system operation, conduct of flight tests, data reduction, and radiation safety. For Vol. 2, see N75-21465. GRA

N75-21467# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
CHEMICAL STRUCTURAL AGING EFFECTS Final Report, Jun. 1971 - Aug. 1974
L. H. Layton Oct. 1974 185 p refs
(Contract F04611-71-C-0049; AF Proj. 3059)
(AD-A002836; AFRPL-TR-74-77) Avail: NTIS CSCL 21/9

An accelerated aging study performed with TP-H1011 propellant has been accomplished and an aging model suggested to describe the age effects on the chemical reactions and mechanical properties. A new and unique technique for separating the solids from the binder in cured propellant has been developed and is described. The crosslinking reaction of the epoxide from the curing agent and the carboxyl from the prepolymer is essentially complete at the end of the cure period. Evidence also shows that the aging reaction may well be the formation of crosslinks between polymer chains at sites of unsaturation. The change in binder gel content and the mechanical properties of the propellant follow an aging model equation that corrects for a perturbation in the aging chemical reaction during the early part of the aging period. A suggestion for the cause of the perturbation is given. GRA

N75-21468# Naval Training Equipment Center, Orlando, Fla.
FEASIBILITY DEMONSTRATION OF A NON-POLLUTANT SYNTHETIC FIRE FIGHTING TRAINER Final Report, Jun. 1970 - Jul. 1974
Edmund Swiatosz, Walter S. Chambers, and Paul D. Grimmer Dec. 1974 54 p refs
(AD-A003011; NAVTRAEQUIPC-IH-241) Avail: NTIS CSCL 05/9

The Navy's fire fighting training facilities include burning diesel oil which results in objectionable pollutants and presents health hazard problems. A possible solution is the replacement of diesel oil with a relatively clean burning gaseous fuel. A system concept of a logic controlled array of gas burners responding to hose water application was demonstrated as feasible. This included studies on burning characteristics of propane for realistic flame response and acceptability of stack gas concentrations. The potential advantages in addition to its clean burning capabilities included safe toxic levels, quick shutdown and start-up, and flexible control of extinguishment and reflash rates. GRA

N75-21469# Barnes and Reinecke, Inc., Chicago, Ill.
NAVAL PYROTECHNICS DEVELOPMENT 1957
William R. Morecock and George A. Platz, Jr. 1974 198 p refs
(Contract N1645-6762)
(AD-A003349) Avail: NTIS CSCL 19/1

The purpose of this manuscript is to record the processes of evolution of Naval pyrotechnics so that future development can progress with a minimum of backtracking and new personnel can be oriented more quickly. The report attempts to assemble and present in one Naval Pyrotechnic publication the pertinent information obtained from experienced personnel, from test records, and from official documents. The period of time covered is from the start of Naval Pyrotechnics to December 31st, 1955. GRA

N75-21470# Air Force Weapons Lab., Kirtland AFB, N.Mex.
PRELIMINARY REPORT ON PROJECT GAS EXPLOSIVE SIMULATION TECHNIQUE Final Report, Nov. 1972 - Feb. 1974
Robert A. Bigoni and Daniel A. Matuska Oct. 1974 128 p refs
(AD-A003388; AFWL-TR-74-252) Avail: NTIS CSCL 19/4

The Air Force Weapons Laboratory (AFWL) fielded a series of experiments to simulate low-altitude nuclear fireball phenomenology. Thirty-two-foot diameter gas containers were filled with a near-stoichiometric mixture of CH4 and O2 and were detonated with yields equivalent to approximately 1500 pounds of TNT. The Reynolds number describing the motion of the resulting hot gases was high enough so that the motion of the gases was dynamically similar to that in a nuclear fireball. GRA

N75-21471# United Aircraft Corp., East Hartford, Conn. Research Labs.
CONTAMINATION EFFECTS ON CATALYST LIFE Final Report, 15 Nov. 1972 - 15 Apr. 1974
G. L. M. Christopher and S. Russell Jul. 1974 179 p refs
(Contract F04611-73-C-0019; AF Proj. 3058)
(AD-A003418; AFRPL-TR-74-38) Avail: NTIS CSCL 21/8

The objective of this program was to determine the levels of selected hydrazine contaminants which adversely affect the life of small monopropellant hydrazine catalytic engines. The poisoning effects of twelve hydrazine contaminants on Shell 405 catalyst were investigated through flow reactor tests and liquid-phase activity measurements. Flow reactor results indicated that sulfur was the worst contaminant. The metal impurities caused moderate degradation through physical covering of the catalyst surface. General catalyst deactivation resulted from sulfur, sodium and zinc contamination, while iron and chromium acted to block the injector flow. Engine evaluations of 1-lb thrust level were performed with most detrimental contaminants. The extent of degradation observed with these impurities was approximately directly proportional to that observed in laboratory tests. This indicates that the deactivating contaminants would cause damage in almost any engine. GRA

N75-21472# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.
PROPELLANT TEST RESULTS, LGM-30 STAGE 3, DISSECTED MOTOR PROGRAM Semiannual Report
Elizabeth M. Dalaba Oct. 1974 189 p refs
(MMEMP Proj. 2MP-105P)
(AD-A002757; MANCP-311(74)) Avail: NTIS CSCL 21/9

This report contains results of propellant testing of LGM-30 Stage 3 dissected motors. Testing was accomplished in accordance with General Test Directive 3 and MME 74NE102. Data from this test period and from previous test periods have been combined and included in regression analyses. Motors 0031064, 0031134, 0032434, 0033174 and Grain 131 have been combined in composite regressions. In general, data are in agreement with past data. Shore A hardness is an exception. There are some statistically significant trends which are not of immediate concern. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-21473 Ohio State Univ., Columbus.
THEORY OF He-3 ON FREE SURFACE OF SUPERFLUID He-4 Ph.D. Thesis
Hui-Hsing Fu 1974 124 p
Avail: Univ. Microfilms Order No. 75-3069

The existence of a bound state for one He-3 atom on superfluid He-4 free surface is examined. Using variational principle and density functional formalism, the shape of the surface, He-3 effective potential, and surface binding energy were determined. The binding energy and surface tension obtained are consistent with the experimental values. At temperatures much lower than the Fermi temperature, a collection of such bound He-3 atoms may form a two-dimensional Fermi liquid. The static and kinetic properties of the Fermi liquid are studied. The interaction between surface He-3 quasiparticles can be partially determined phenomenologically from measurements of surface second sound velocity and quasiparticle effective mass. From the interaction, both the Fermi liquid transport coefficients and the transition temperature at which He-3 becomes superfluid were calculated.
Dissert. Abstr.

N75-21474 Washington Univ., Seattle.
THE INFLUENCE OF THE SURFACE ON THIN SUPERFLUID He-4 FILMS Ph.D. Thesis
John Aloysius Herb 1974 96 p
Avail: Univ. Microfilms Order No. 75-3992

Two different techniques were employed to study the onset of superfluidity in thin He-4 films. The results are qualitatively different from other onset measurements, the differences being attributed to the greater uniformity of the exfoliated graphite substrate used in the present study. The first experiment studies mass transport of He-4 films. Four distinct flow regimes are observed and are interpreted as being indicative of a more ideal film than previously reported. A model of surface heterogeneity is discussed and used to explain a variety of onset phenomena that were observed in the past, but which are not understood. The model is applied to a current experiment; a frequency dependent onset temperature is predicted. Subsequent measurements showed that higher frequencies probed smaller regions of the substrate thus verifying the prediction. Dissert. Abstr.

N75-21475 Oregon Univ., Eugene.
EFFECTIVE INTERACTION AND STATISTICAL MECHANICS IN THE PAIR THEORY OF LIQUID HELIUM Ph.D. Thesis
Seung Yong Yoon 1974 90 p
Avail: Univ. Microfilms Order No. 75-3935

The pair theory of liquid helium is discussed by assuming generalized Bose condensation. A variational method is formulated to determine the relationship between the effective interaction and the elementary excitation spectrum. The resulting system of nonlinear integral equations is solved self-consistently to obtain the effective potential from the experimental excitation spectrum. Contrary to the previous arguments, the potential is found to be strongly repulsive for this model. The temperature dependent problem is described by means of the thermodynamically equivalent Hamiltonian method. For the potential fixed with change in temperature, the temperature dependence of the excitation spectrum is investigated. The condensate fraction at zero temperature is 50% and decreases gradually as temperature increases up to a critical point. Dissert. Abstr.

N75-21476 Louisiana State Univ., Baton Rouge.
A FIELD THEORETIC APPROACH TO ELEMENTARY EXCITATIONS IN SUPERFLUID LIQUID HELIUM Ph.D. Thesis
Gary Stephen Grest 1974 172 p
Avail: Univ. Microfilms Order No. 75-1927

There were several theories developed to derive the Landau phonon-roton spectrum for superfluid liquid helium. The various methods are presented in a unified manner which brings out their complete equivalence. Arguments are given which seem to indicate that a modified version of the Bogoliubov approximation for a weakly interacting gas may be equivalent to the density variable approaches, pioneered by Nishiyama, Berdahl and Bloch, Bogoliubov and Zubarev (BZ), and Sunakawa and co-workers. In these theories, density is used as a coordinate to describe the fluid. In the first two theories, the single particle Bose operators are expressed in terms of density and another variable which are consistent with their basic commutation relations. In the latter two, a current operator is introduced which with the density forms a closed algebra. It is shown that the variables, density and current, give a complete description of a system of spinless, identical bosons. Dissert. Abstr.

N75-21477# California Univ., Livermore. Lawrence Livermore Lab.
FEASIBILITY OF ELECTROCHEMICAL MACHINING FACILITY AT LLL. A COMMITTEE REPORT
W. L. Randall, comp. Oct. 1974 5 p refs
(Contract W-7405-eng-48)
(UCID-16618) Avail: NTIS HC $3.25

Electrochemical machining is most suitable for applications where: large production quantities are required in difficult to machine shape or material that is suitable for ECM and the material hardness and/or surface requirements make the job impossible or at least very unattractive to do by any method except ECM. Problems at LLL have not required these specifications, but a possibility may arise in the production of turbine blades or buckets for geothermal applications. An ECM facility would require one million dollars for equipment. NSA

N75-21478# California Univ., Berkeley. Lawrence Berkeley Lab.
CRYOGENIC PROPERTIES OF Fe-Mn AND Fe-Mn-Cr ALLOYS
M. J. Schanfein Aug. 1974 65 p refs
(Contract W-7405-eng-48)
(LBL-2749) Avail: NTIS HC $4.25

When a bcc structure was produced, increasing Mn contents are detrimental to low temperature toughness. At Mn levels greater than 12%, the ductile-brittle transition temperature (DBTT) dropped rapidly with the (epsilon + gamma) phases, but the yield strength also decreased. Increases in the yield strength were achieved without appreciable increase in the DBTT or decreases in the Charpy upper shelf energy and fracture toughness by greater Mn additions and by Cr additions. NSA

N75-21479# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF A FEASIBLE PROCESS FOR THE SIMULTANEOUS REMOVAL OF NITROGEN OXIDES AND SULFUR OXIDES FROM FOSSIL FUEL BURNING POWER PLANTS Ph.D. Thesis
D. T. Clay and S. Lynn Jun. 1974 290 p refs
(Contract W-7405-eng-48)
(LBL-3059) Avail: NTIS HC $8.75

A catalyst-absorbent in a net reducing flue gas effects the removal of SO2 by absorption as ferrous sulfide or sulfate and the removal of NO by reduction to nitrogen or ammonia. The solid is regenerable; reaction with air produces a rich stream of SO2 and ferric oxide. The SO2 may be converted to a saleable H2SO4 and the solid is recycled to the process. The process is capable of greater than 90% removal of SO2 and NO. The emissions of H2CO, and NH3 are well below acceptable emission levels. The concentration of the solids in the effluent stream is not significantly increased over normal flyash levels. There is no significant increase in the quantity of solids which must be disposed of. No flue gas cooling or reheating is required. There are no large storage vessels or slurry transport lines within the process. The regeneration process is thermally self-sufficient.
Author (NSA)

N75-21480# California Univ., Livermore. Lawrence Livermore Lab.
LIQUID PLUGGING IN IN SITU COAL GASIFICATION PROCESSES
D. W. Gregg 25 Oct. 1974 7 p refs
(Contract W-7405-eng-48)
(UCRL-51686) Avail: NTIS HC $3.25

The presence of liquids can severely alter the spacial

propagation characteristics of the flame front in an in situ coal gasification process. In a cocurrent burn, the liquids, water, and coal tars will be baked or pyrolyzed out of the coal in the hot zone near the flame front and will condense on cooler coal further downstream from the flame front. In the region where condensation is taking place, the liquids can plug the formation and thus alter or stop the gas flow pattern necessary for maintaining a spacially controlled flame front. Liquid plugging effects and their relationship to the permeability and the absolute crack sizes in the formation are discussed in a semiquantitative manner. The calculations presented are a rough guide to the requirements for preparing the coal seam with hydraulic or explosive fracturing, when such fracturing is needed.

Author (NSA)

N75-21481# Michigan State Univ., East Lansing.
THERMAL CONDUCTIVITY OF SOLID ARGON Ph.D. Thesis
D. K. Christen 1974 151 p refs Sponsored by ERDA
(COO-1574-39) Avail: NTIS HC $6.25

A cryogenic apparatus was designed and constructed to form large-grained, essentially free-standing samples of crystalline Argon. Subsequent in situ measurements of the thermal conductivity were made by a linear flow method, covering a temperature range from the triple point, 83.8 K, to liquid He temperatures. The low temperature data were highly reproducible within a single run, while the high temperature data were reproducible among different runs. The data were of sufficient density to enable quantitative analysis in terms of present theory for heat transport in insulating solids at low temperatures. First principles calculations were performed of the anharmonic crystal force contribution to the thermal resistivity. The results indicate that observed deviations from the T-1 temperature dependence expected of alpha (T) at high temperatures can be quantitatively explained in terms of the effects of thermal expansion on the lattice vibrational frequencies. Author (NSA)

N75-21482# Michigan State Univ., East Lansing.
PROPERTIES OF RARE-GAS SOLIDS
[1975] 15 p ref
(Contract AT(11-1)-1574)
(COO-1574-44) Avail: NTIS HC $3.25

The properties of rare gas solids and rare gases are considered. Theoretical and experimental calculations and experimental results of Kapitza resistance are compared. Results on thermal conductivity of solid argon in the range from 2 to 83.8 K were successful. The results were treated by current theories of heat transport in solids and phonon scattering in solids, the defect structure of crystals, interaction potential for Ar atoms, and the application of the phenomena to thermal conductivity are analyzed. The interaction of rare gases with physiological systems was studied. Techniques for measuring diffusion of Xe through membranes were improved. NSA

N75-21483# Excalibur Corp., Waltham, Mass.
CRYOGENIC WHOLE AIR SAMPLER SYSTEM Final Report, Sep. 1973 - May 1974
Paul R. Gould May 1974 19 p
(Contract F19628-74-C-0048; AF Proj. 6687)
(AD-A003395; W-679; AFCRL-TR-74-0452) Avail: NTIS CSCL 14/2

A cryogenic whole air sampling device, capable of capturing and retaining an uncontaminated and as much as possible unaltered sample of air up to 140,000 feet is the desired end result of this investigation. The design for such a device is presented in detail along with some laboratory performance data. The design uses liquid nitrogen and liquid helium as the refrigerants, with reservoir capacities suitable for 20 hour flights, during which a 1 mol sample can be collected over a 1 hour period and returned frozen to the laboratory for analysis. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N75-21484 British Broadcasting Corp., Kingswood (England). Engineering Div.
AN EXPERIMENTAL 8-PHASE MODULATION SYSTEM FOR DISTRIBUTION OF DIGITAL TELEVISION SIGNALS
R. V. Harvey Mar. 1975 23 p refs
(BBC-RD-1975/10) Avail: BBC, Kingswood Warren, Tadworth, Surry, England

The requirements of radio frequency distribution systems for digital television signals are outlined with reference to satellite links and methods of digitally modulating and demodulating the radio frequency carrier are discussed. The design and construction of an experimental 8-phase phase-shift-keyed system are described and some limited conclusions are drawn from the results obtained. Author

N75-21485* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TELEVISION NOISE REDUCTION DEVICE Patent
Bernard L. Gordon (Taft Broadcasting Corp., Houston, Tex.) and James C. Stamps, inventors (to NASA) (Taft Broadcasting Corp., Houston, Tex.) Issued 1 Apr. 1975 6 p Filed 17 Oct. 1973 Sponsored by NASA
(NASA-Case-MSC-12607-1; US-Patent-3,875,584; US-Patent-Appl-SN-407323; US-Patent-Class-358-36; US-Patent-Class-178-DIG.12) Avail: US Patent Office CSCL 17B

A noise reduction system that divides the color video signal into its luminance and chrominance components is reported. The luminance component of a given frame is summed with the luminance component of at least one preceding frame which was stored on a disc recorder. The summation is carried out so as to achieve a signal amplitude equivalent to that of the original signal. The averaged luminance signal is then recombined with the chrominance signal to achieve a noise-reduced television signal. Official Gazette of the U.S. Patent Office

N75-21486* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DIGITAL TRANSMITTER FOR DATA BUS COMMUNICATIONS SYSTEM Patent
George Eugene Proch, inventor (to NASA) (Lockheed Electron. Co., Houston, Tex.) Issued 1 Apr. 1975 8 p Filed 27 Dec. 1973 Supersedes N74-17888 (12 - 09, p 1023) Sponsored by NASA
(NASA-Case-MSC-14558-1; US-Patent-3,875,332; US-Patent-Appl-SN-428994; US-Patent-Class-178-58A; US-Patent-Class-178-79) Avail: US Patent Office CSCL 17B

An improved digital transmitter for transmitting serial pulse code modulation (pcm) data at high bit rates over a transmission line is disclosed. When not transmitting, the transmitter features a high output impedance which prevents the transmitter from loading the transmission line. The pcm input is supplied to a logic control circuit which produces two discrete logic level signals which are supplied to an amplifier. The amplifier, which is transformer coupled to the output isolation circuitry, converts the discrete logic level signals to two high current level, ground isolated signals in the secondary windings of the coupling transformer. The latter signals are employed as inputs to the isolation circuitry which includes two series transistor pairs operating into a hybrid transformer functioning to isolate the transmitter circuitry from the transmission line.

Official Gazette of the U.S. Patent Office

N75-21487 Maryland Univ., College Park.
PARAMETER ESTIMATION IN THE PRESENCE OF PHASE ERROR Ph.D. Thesis
Russell Glock, Jr. 1974 138 p
Avail: Univ. Microfilms Order No. 75-4952

Communication theory has the task of extracting information

about a signal from the ever present perturbing influences. Classically, only additive white Gaussian noise was considered, but with the increased requirements of modern radar, the effects of multiplicative phase error must also be considered. For a signal, Doppler and complex amplitude, in the presence of both additive noise and multiplicative phase error, maximum likelihood receivers, Cramer-Rao lower bounds, parameter estimates and the ambiguity functions are investigated for two cases. These are: (1) the threshold case where the received signal to noise ratio is assumed small and (2) the small phase error case where the phase error variance is assumed small. Likelihood functions are given for both cases. Dissert. Abstr.

N75-21488 Minnesota Univ., Minneapolis.
MULTI-CHANNEL BINARY MODULATION UTILIZING A COMPOSITE ERROR CRITERION Ph.D. Thesis
Howard Eugene Jones 1974 282 p
Avail: Univ. Microfilms Order No. 75-2113

Encoding a number of independent speech signals onto a single binit stream and their subsequent reconstruction is studied. The basic approach taken was to consider the problem as one of constructing a binit stream in such a manner that the set of reconstructed signals is best in some sense. A general encoding and multiplexing configuration is proposed that bases the performance estimation on measurements taken on reconstructed signals obtained from a model of the demultiplexer/encoder contained within the encoder/multiplexer. This is followed by the introduction of a particular version of the general configuration, MCDM, which is examined in depth subsequently.
Dissert. Abstr.

N75-21489 Iowa State Univ. of Science and Technology, Ames.
THE EFFECTS OF SURFACE ROUGHNESS ON WAVE-GUIDE-MODE PROPAGATION Ph.D. Thesis
Jose A. Azarcon, Jr. 1974 82 p
Avail: Univ. Microfilms Order No. 75-3287

The effects of surface roughness and finite ground conductivity are calculated using the full wave solution for surface based tropospheric ducts having linear and bilinear profiles of a refractive index. Surface roughness is expressed in terms of a scalar rough surface reflection factor F sub rs which gives the ratio of the similarly polarized components of the far fields along the specular direction for a given rough surface and a plane surface, both having the same complex dielectric constant. Through F sub rs, an equivalent surface can be found by an inversion of the equation for the Fresnel reflection coefficient. The waveguide mode propagation problem is then solved for two duct profiles over imperfectly conducting media. Results are given for mode attenuation rates as a function of surface roughness, surface dielectric constants, refractive index profile, wavelength, and duct depth. Dissert. Abstr.

N75-21490 Ohio State Univ., Columbus.
THE NEAR FIELD ANALYSIS OF APERTURE AND SPIRAL ANTENNAS BY THE PLANE WAVE SPECTRUM METHOD Ph.D. Thesis
Chin-Long James Chen 1974 97 p
Avail: Univ. Microfilms Order No. 75-3025

A modified steepest descents technique was applied to the PWS formulation to obtain near field formulations for large circular apertures and strip apertures. These formulations can be reduced to simple Fresnel integral terms and, consequently, permit more rapid and efficient computations and more direct physical interpretation than previous near field formulations. The conventional PWS formulation for antenna near field was found quite useful for accurate near field analysis in the radome problem. The applications of the PWS method to the near field analysis and radome problem of the planar log-spiral antenna are presented. A ring current distribution is assumed to simulate the current of the planar log-spiral antenna. Dissert. Abstr.

N75-21491 California Univ., San Diego.
IONOSPHERE PLASMA INSTABILITIES AND ANOMALOUS ABSORPTION Ph.D. Thesis
Hsing-Cheng Chen 1974 140 p
Avail: Univ. Microfilms Order No. 75-4633

Radio wave absorption caused by ionospheric irregularities plays an important part in radio wave propagation. Assuming that the irregularities in ion density are isotropic and have a Gaussian autocorrelation function, the enhancement in the real part of the plasma conductivity, due to the irregularities is calculated. The values of this enhancement are then considered in various special cases of interest and also the total height integrated absorption due to irregularities is computed numerically. Saturation of the decay instability in the presence of a magnetic field is considered. The nonlinear evolution of the decay instability is studied in the presence of a uniform external magnetic field for comparable ion and electron temperatures in the limit of small spontaneous emission. Dissert. Abstr.

N75-21492 Ohio State Univ., Columbus.
ELECTROMAGNETIC STRESS-ENERGY-MOMENTUM TENSOR AND ITS APPLICATIONS IN ELECTRODYNAMICS OF MOVING MEDIA Ph.D. Thesis
Chiwei Dick Chung 1974 110 p
Avail: Univ. Microfilms Order No. 75-3026

The controversial issue of whether Minkowski's tensor or Abraham's tensor is the appropriate electromagnetic stress-energy-momentum tensor form in ponderable media is investigated. Various aspects of differences between the two tensors are discussed. As far as experiments are concerned, the predictions of Minkowski's tensor are consistent with experiments, but Abraham's tensor fails in some experiments. The problem of reflection and transmission by a moving dielectric medium offers a good example for illustrating the applications of the electromagnetic stress-energy-momentum tensor. It is shown by the use of the stationary phase method that Minkowski's tensor is the appropriate electromagnetic stress-energy-momentum tensor. Dissert. Abstr.

N75-21493 Princeton Univ., N.J.
DIGITAL AND ANALOG PHASE LOCK LOOPS-ANALYSIS AND APPLICATIONS TO DIGITAL COMMUNICATION SYSTEMS Ph.D. Thesis
Aaron Weinberg 1974 167 p
Avail: Univ. Microfilms Order No. 75-6689

Digital and analog phase lock loops are analyzed along with their applications to digital communication systems. Digital phase lock loops (DPLL) are characterized by zero-tracking of the incoming signals. The equations of operation for first and second order loops are derived and the analyses are confirmed by numerical results and simulation. The application of DPLL's to the optimum discrete-time demodulation of random angle modulated signals is considered. It is shown that the zero-tracking DPLL is a realizable approximation to the maximum a posteriori discrete-time demodulator. The effects of noise and transmission delays in a class of mutual synchronization systems, which employs analog phase lock loops are investigated. The analytical ideas are developed with respect to a hypothetical one station system which contains a first order phase lock loop and extended to a two station system, containing first or second order loops, and then to a mutual synchronization system of arbitrary size. Preliminary results on the transient behavior of a mutual synchronization system are obtained via an examination of the transient performances of one and two station systems. Results are discussed. Dissert. Abstr.

N75-21494 Toledo Univ., Ohio.
AN APPLICATION OF QUEUEING THEORY TO THE DESIGN OF CHANNEL REQUIREMENTS FOR SPECIAL PURPOSE COMMUNICATIONS SATELLITES Ph.D. Thesis
Gerald Fredrick Hein 1974 111 p
Avail: Univ. Microfilms Order No. 75-6481

The use of satellites for wide area direct broadcasts results in large power requirements for the satellite. Such satellites are or will be used to provide remote health care delivery and educational services to remote regions and many other new services including warnings to the public of impending natural disasters. These new special purpose satellites are very cost sensitive to the number of broadcast channels, usually will have Poisson arrivals, fairly low utilization (less than 35%), and a very high availability requirement. To solve the problem of determining the effects of limiting C the number of channels, the Poisson arrival infinite server queueing model is modified to describe the many server case. The model is predicated on the reproductive property of the Poisson distribution. For small changes

in the Poisson parameter under the assumptions stated previously, the resulting distribution of states or numbers in the system is Poisson. A difference equation is developed to describe the change in the Poisson parameter. Dissert. Abstr.

N75-21495*# Alabama Univ., University. College of Engineering.
THRESHOLD DETECTION IN AN ON-OFF BINARY COMMUNICATIONS CHANNEL WITH ATMOSPHERIC SCINTILLATION Final Report
William E. Webb Jan. 1975 158 p refs
(Contract NAS8-25562)
(NASA-CR-120737; BER-186-70) Avail: NTIS HC $6.25 CSCL 17B

The optimum detection threshold in an on-off binary optical communications system operating in the presence of atmospheric turbulence was investigated assuming a poisson detection process and log normal scintillation. The dependence of the probability of bit error on log amplitude variance and received signal strength was analyzed and semi-empirical relationships to predict the optimum detection threshold derived. On the basis of this analysis a piecewise linear model for an adaptive threshold detection system is presented. The bit error probabilities for nonoptimum threshold detection systems were also investigated. Author

N75-21496*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK
15 Apr. 1975 212 p refs
(Contract NAS7-100)
(NASA-CR-142646; JPL-PR-42-26) Avail: NTIS HC $7.25 CSCL 17B

The primary objectives during this portion of the extended mission were to assure survival of the spacecraft for a third Mercury encounter through conservation of attitude control gas and to conduct trajectory correction maneuvers (TCMs) as necessary to target the spacecraft for a solar occultation zone pass. Special support activities included TCMs 6 and 7 conducted on October 30, 1974 and on February 12-13, 1975, respectively. This period also saw the DSN interface organization involved in (1) the allocation of sufficient coverage to assure accurate orbit determination solutions, (2) monitoring of DSN implementation for Viking to assure maintenance of compatible interfaces and capabilities required for Mariner 10, and (3) the development of encounter coverage, sequences, and readiness test plans.
Author

N75-21497*# Washington Univ., St. Louis, Mo. Center for Development Technology.
TELECOMMUNICATIONS TECHNOLOGY AND RURAL EDUCATION IN THE UNITED STATES
Jay R. Perrine Mar. 1975 285 p refs
(Grant NGR-26-008-054)
(NASA-CR-142694; CDTCG-R(T)-75/1; THA-75/1) Avail: NTIS HC $8.75 CSCL 09F

The rural sector of the US is examined from the point of view of whether telecommunications technology can augment the development of rural education. Migratory farm workers and American Indians were the target groups which were examined as examples of groups with special needs in rural areas. The general rural population and the target groups were examined to identify problems and to ascertain specific educational needs. Educational projects utilizing telecommunications technology in target group settings were discussed. Large scale regional ATS-6 satellite-based experimental educational telecommunications projects were described. Costs and organizational factors were also examined for large scale rural telecommunications projects.
Author

N75-21498# Carleton Univ., Ottawa (Ontario). Wired City Lab.
THE EDUCATIONAL COMMUNICATIONS PROJECT
Dec. 1974 136 p
Avail: NTIS HC $5.75

The unification is discussed of modern communications technology as a resource management tool with accessible or producible pedagogical software in a manner that will augment learning processes. It is shown that a reliable, flexible, and efficient technological system will complement the student-teacher interaction with information resources hitherto unexploited in the educational context. It is shown that our application of educational communications implies a heuristic process to involve those who would provide the technical service of the system, those who would use it in teaching and learning, and those who would evaluate its effectiveness.
Author

N75-21499# Carleton Univ., Ottawa (Ontario). Wired City Lab.
THE WIRED CITY LABORATORY: STUDIES IN INTERACTIVE BROADBAND COMMUNICATIONS
D. C. Coll, D. A. George, L. H. Strickland, S. A. Paterson, P. D. Guild, J. M. McEown, L. R. Morris, and A. J. Dakin [1974] 214 p refs Sponsored by Can. Dept. of Commun.
Avail: NTIS HC $7.25

The development and operation of a laboratory for both the application and the technology of broadband communications are discussed. The Wired City Simulation Facility was established in the systems engineering department of Carleton University, Canada. The facility provides a pilot communications system for analyzing and solving broadcasting problems. The facility uses telecommunications for access to information systems and simulates multi-point audio, video, and data communications representative of those available in and between urban areas.
Author

N75-21500# Sandia Labs., Albuquerque, N.Mex.
EXPLORATORY DEVELOPMENT OF A TELEMETRY UP-LINK FOR AN EARTH PENETRATOR
T. W. H. Caffey Dec. 1974 53 p refs
(Contract AT(29-1)-789)
(SAND-74-0283) Avail: NTIS HC $4.25

The theory, design, development, and field testing of a telemetry-quality communications link with which signals may be sent to the surface of the earth from a penetrator buried as much as 50 meters in the earth are described. A bit rate of 1000 bits per second with an error rate of less than one error in 100000 bits was finally achieved from a depth of 52 meters using 10 watts in a PCM/FM system operating at 10.5 kHz.
Author (NSA)

N75-21501# Mitre Corp., McLean, Va.
SYSTEM DEFINITION FOR ARMY WIRED GARRISON C-E DESIGN. VOLUME 1: EXECUTIVE SUMMARY
Jul. 1974 35 p refs
(Contract F19628-73-C-0001; AF Proj. 8380)
(AD-A002549; MTR-2863-Vol-1) Avail: NTIS CSCL 17/2

The System Definition Study Phase for Army Wired Garrison C-E Design has resulted in the selection of Ft. Bliss, Texas as the testbed garrison, the identification of candidate services for evaluation in the testbed and the preparation of a preliminary testbed implementation plan. The rationale used in rank-ordering the testbed garrison candidates is described. Analysis of user information transfer needs has identified the administrative and training functions as the prime mission areas for evaluation. Two alternative implementation approaches for the testbed are proposed; estimated programs costs and schedules are presented. The volume, provides an overview of the work performed. GRA

N75-21502# Mitre Corp., McLean, Va.
SYSTEM DEFINITION FOR ARMY WIRED GARRISON C-E DESIGN. VOLUME 2: SYSTEM DEFINITION
Jul. 1974 222 p refs
(Contract F19628-73-C-0001; AF Proj. 8380)
(AD-A002550; MTR-2863-Vol-2) Avail: NTIS CSCL 17/2
For abstract, see N75-21501.

N75-21503# Mitre Corp., McLean, Va.
SYSTEM DEFINITION FOR ARMY WIRED GARRISON C-E DESIGN. VOLUME 3: APPENDICES
Jul. 1974 246 p
(Contract F19628-73-C-0001; AF Proj. 8380)
(AD-A002551; MTR-2863-Vol-3) Avail: NTIS CSCL 17/2

The purpose of the appendix is to describe progress on needs research and to make broad commentary upon the statement of needs that has been made in earlier parts of this report, particularly in Section 3.3 of Volume II. Further, it presents certain data together with analysis of these data obtained during specific visits in order to sample Army needs. GRA

N75-21504# Collins Radio Co., Dallas, Tex.
PACKET RADIO COMMUNICATIONS PROJECT Quarterly Technical Report
F. H. Dickson Dec. 1974 44 p
(Contract DAHC15-73-C-0192; ARPA Order 2305)
(AD-A002745; Rept-523-0699857-001C3L) Avail: NTIS CSCL 17/2

Four major areas of activities on support of packet radio communications are discussed in this document. These are: (1) description of software and operating system in the first experimental repeater; (2) description of rf head in first experimental repeater; (3) description of overall mechanical design of first experimental repeater; and (4) discussion of equipment configuration to realize various experimental network elements in the experimental test bed. GRA

N75-21505# North Electric Co., Galion, Ohio. Government Products Div.
COMMUNICATIONS PROCESSOR SYSTEM (CPS) MODELING APPROACH Technical Report, Oct. 1973 - Aug. 1974
Marvin Monroe Nov. 1974 57 p refs
(Contract F30602-73-C-0314)
(AD-A002835; RADC-TR-74-290) Avail: NTIS CSCL 17/2

The purpose of the Communications Processor System Study is to develop a family of common computer processor modules suited to future military requirements of multi-purpose switching, including data and voice. One task in this study is to verify the design of a processor by computer modeling. This report presents a discussion of the requirements of an adequate model, describes the techniques chosen to fulfill the study objectives, and states the plans regarding the extent to which these techniques will be applied during this study. GRA

N75-21506# Naval Research Lab., Washington, D.C.
ATMOSPHERIC TURBULENCE AND THE EXTENSION OF THE RADIO HORIZON
Merrill I. Skolnik Oct. 1974 56 p refs
(NRL Proj. MR-2903)
(AD-A002929; NRL-MR-2903) Avail: NTIS CSCL 20/14

The possibility that atmospheric turbulence (clear air turbulence) can cause extended propagation beyond the optical line of sight is examined. It is possible for a distant transmitter to interfere with a receiver via scattering from atmospheric turbulence, but it is not likely that a radar will receive distant ground echo via scattering from turbulence. From a compilation of published data it is shown that the structure constant of the atmosphere (a measure of scattering) is a function of altitude with an apparent maximum in the vicinity of 500 to 1000 m. GRA

N75-21507# Naval Research Lab., Washington, D.C.
TRACKING SYSTEM FOR TWO ASYNCHRONOUSLY SCANNING RADARS
Ben H. Cantrell, Gerard V. Trunk, and Jon D. Wilson 5 Dec. 1974 87 p refs
(NRL Proj. R02-54.101; RF12151)
(AD-A002927; NRL-7841) Avail: NTIS CSCL 17/9

A tracking system was designed to use detections from two asynchronously scanning radars located in close proximity. The system differs from previous single-radar tracking systems in timing, filter updating, and track initiation, and in using detections from two radars. Simulation results show that the system operating on 100 clutter points and 50 targets requires about 3.0 s using a FORTRAN program on a Nova 800 computer. GRA

N75-21508# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
A MODEL FOR ESTIMATING JOINT PROBABILITIES OF CLOUD-FREE LINES-OF-SIGHT FROM UNCONDITIONAL PROBABILITIES
Iver A. Lund and Donald D. Grantham 1974 7 p refs Repr. from Conf. on Aerospace and Aeron. Meteorology (6th), El Paso, Tex., 12-15 Nov. 1974 p 438-443 Submitted for publication (AF Proj. 8624)
(AD-A003160; AFCRL-TR-74-0586) Avail: NTIS CSCL 22/2

Signals transmitted through the atmosphere in the visible and infrared portions of the electromagnetic spectrum can be seriously degraded by clouds between the source and the receiver. A previously published model yields from the probability distribution of sky cover, an estimate of the unconditional probability of a cloud-free line-of-sight through the atmosphere at any desired elevation angle and geographical location. Another published model yields an estimate of the joint probability of a cloud-free line-of-sight from n of m observing sites, from joint probabilities of the sky cover categories. This paper describes a model for estimating the joint probabilities from the easily obtainable unconditional probabilities only. Author (GRA)

N75-21509# Electronic Communications, Inc., St. Petersburg, Fla.
OPTIMIZED DIGITAL MESSAGE ENTRY DEVICE (DMED) Final Report
Richard K. Smith Nov. 1974 51 p ref
(Contract F30602-72-C-0063)
(AD-A002842; ECI-1-AER-0038; RADC-TR-74-280) Avail: NTIS CSCL 17/2

The Optimized Digital Message Entry Device Program was an exploratory development program which resulted in the design and fabrication of two exploratory development models of a portable, two-way Digital Message Entry Device (DMED). The DMED has been designed almost exclusively with complementary-metal-oxide-semiconductor (CMOS) MSI logic permitting five-day operation without changing or recharging the self-contained batteries. The device has two selectable bit rates, 150 and 600 bps; two symbol sets, alphanumeric (ASCII code) and hexidecimal (4-bit binary code); and two types of error control coding, a block (iterated) error detecting code for use with the alphanumeric symbol set and a Hamming 8,4 error correcting/detecting code which is used in conjunction with the hexidecimal symbol set. An internal adaptive audio FSK modem (which permits the DMED to interface with the audio circuits of voiceband radios) is a novel design implemented exclusively with CMOS logic and micropower FET amplifiers. GRA

N75-21510# Coast Guard Research and Development Center, Groton, Conn.
TEST OF COMPATIBILITY OF THE LOCATE (R) 3 DISTRESS ALERTING AND LOCATING SYSTEM DALS IN CO-CHANNEL OPERATION WITH AN FM VOICE COMMUNICATION SYSTEM Interim Report, Dec. 1973 - Feb. 1974
W. A. DeGeorge and R. D. Crowell Jul. 1974 58 p
(Contract DOT-CG-751140)
(AD-A002827; CGR/DC-20-74; USCG-D-24-75) Avail: NTIS CSCL 17/2

A test of Co-channel FM compatibility of the LOCATE (R) III DALS and a voice communication system was conducted to determine what effects each system has on the other when operated simultaneously on a common FM channel. The test was conducted in two phases. Phase I of the test determines the effect on voice communications intelligibility as a function of DALS interference. Phase II determines the effect on DALS operation as a function of voice communications. The test shows that the two systems can be operated in a co-channel configuration; however, some degradation of each system's performance can be expected. GRA

N75-21511# Mitre Corp., Bedford, Mass.
AN ANALYSIS OF A SLOTTED WAVEGUIDE, FREQUENCY SCANNED, ANTENNA NEAR CUTOFF
M. R. Weiss Nov. 1974 55 p refs
(Contract f19628-71-C-0002; AF Proj. 7080)
(AD-A003411; MTR-2841; ESD-TR-74-197) Avail: NTIS CSCL 09/5

Two major concerns in the designs of X-band precision approach radars, their cost and their ability to detect and track aircraft in heavy rain clutter are discussed. A particular limited-scan, linearly polarized antenna was investigated which could be used in conjunction with a digital filter for the suppression of clutter, and thereby provide a low cost system concept. This antenna used the inherent dispersion of slotted waveguide near cutoff for frequency scan in elevation. Such antennas are found to be sensitive to waveguide dimensional errors. An analysis is presented of the effect of such errors on the formation of the frequency-scanned beam. Basic design equations are developed for a narrow scan angle application. The effect of statistical

errors is analyzed and average radiation patterns are presented which indicate the degree of degradation. Author

N75-22047 Technische Hogeschool, Eindhoven (Netherlands).
MATHEMATICAL THEORIES OF RADIO-WAVE PROPAGATION: AN HISTORICAL SURVEY
H. Bremmer *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 14 p refs (For availability see N75-22045 13-70)

N75-22050 Harry Diamond Labs., Washington, D.C.
A THIRD-ORDER SPECULAR-POINT THEORY FOR RADAR BACKSCATTER
James E. Seltzer *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 16 p refs (For availability see N75-22045 13-70)

N75-22060 McDonnell Aircraft Co., St. Louis, Mo.
POLARIZATION DISCRIMINATION IN REMOTE SENSING
J. C. Leader *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

N75-22061 Naval Research Lab., Washington, D.C.
THE SECOND ORDER DOPPLER SPECTRUM OF RADAR SEA ECHO FOR FREQUENCIES ABOVE VHF
G. R. Valenzuela *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)

N75-22065 Rome Univ. (Italy). Ist. di Elettronica.
STRUCTURE OF TROPOSPHERIC INHOMOGENEITIES AS DEDUCED FROM INTERFEROMETRIC MEASUREMENTS
Giovanni Dauria and Domenico Solimini *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 13 p refs (For availability see N75-22045 13-70)

N75-22072 Institut fuer Physikalische Weltraumforshung, Freiburg (West Germany).
ANTENNA IMPEDANCE OF A GROUND-BASED EMITTER IN THE VERY LOW FREQUENCY DOMAIN
R. Grabowski *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

N75-22073 Admiralty Surface Weapons Establishment, Portsmouth (England).
ANTENNA AND CONDUCTING SCREEN ON A LOSSY GROUND
J. F. Goodey *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

N75-22077 Imperial Coll. of Science and Technology, London (England).
SERVICE AREA PREDICTION IN THE VHF AND UHF BANDS
H. Page *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 8 p refs (For availability see N75-22045 13-70)

N75-22078 Research Inst. of National Defence, Stockholm (Sweden).
PREDICTION AND CALCULATION OF TRANSMISSION LOSS IN DIFFERENT TYPES OF TERRAIN
A. Blomquist and L. Ladell *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

N75-22079 Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
MIXED-PATH CONSIDERATIONS FOR RADIO-WAVE PROPAGATION IN FOREST ENVIRONMENTS
T. Tamir *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs Sponsored in part by ECOM and Army Land Warfare Lab. (For availability see N75-22045 13-70)

N75-22080 Shape Air Defense Technical Center, The Hague (Netherlands).
INFLUENCE OF TOPOGRAPHY AND ATMOSPHERIC REFRACTION IN UHF GROUND-AIR COMMUNICATIONS
A. N. Ince and H. P. Williams *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 26 p refs (For availability see N75-22045 13-70)

N75-22082 European Space Research Organization, Noordwikj (Netherlands).
MULTIPATH IN AN AERONAUTICAL SATELLITE SYSTEM
H. J. Wuennenberg *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 18 p refs (For availability see N75-22045 13-70)

N75-22262* Kanner (Leo) Associates, Redwood City, Calif.
RADIO BRIDGES THROUGH THE UNIVERSE
A. Prokhorov and B. Shteynshleyger *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 63-67 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 61-64 (For availability see N75-22255 13-99)
CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-21512 Duke Univ., Durham, N.C.
ANALYSIS OF TRANSIENT CHARACTERISTICS AND STARTING OF A FAMILY OF POWER CONDITIONING CIRCUITS: TWO-TRANSISTOR SATURABLE CODE PARALLEL INVERTERS Ph.D. Thesis
Fred Chai Yan Lee 1974 172 p
Avail: Univ. Microfilms Order No. 75-2397

Static self-oscillating inverters employing a saturable magnetic core in conjunction with two switching transistors have the ability of providing dc-to-square-wave inversion with very high efficiency. In these inverter circuits, two transistors are used as power switches and the square-loop core is used as the principal frequency determining element. Although such an inverter circuit is composed of very few components, its proper operation depends on the complex interactions of several nonlinearities: transistors, diodes, and a square-loop magnetic core. A family of five static dc-to-square-wave inverters is analyzed using piecewise-linear models for the nonlinear characteristic of the transistors, diodes, and saturable-core devices. Dissert. Abstr.

N75-21513*+ General Electric Co., Utica, N.Y. Aerospace Electronic Systems.
DC-DC CONVERTERS Final Report
28 Oct. 1974 50 p
(Contract NAS8-26383)
(NASA-CR-120728) Avail: NTIS HC $3.75 CSCL 10B

Electrical and mechanical characteristics of dc-dc converters are discussed along with the results of performance tests. Test data, data tables, operational problems, and mechanical drawings are included. M.J.S.

N75-21514 State Univ. of New York, Buffalo.
TIME DOMAIN DESIGN OF STABLE RECURSIVE DIGITAL FILTERS Ph.D. Thesis
George William Bordner 1974 155 p
Avail: Univ. Microfilms Order No. 75-1469

The method is presented, whereby a given discrete, finite-time,

impulse response is approximated by the response of an nth order recursive filter. The approximation is performed in the time domain and is derived on the basis of the minimum squared error between the desired impulse response and the impulse response of the recursive filter model. It is proven that the method converges to a solution which may be an interior stationary point, where the gradient is zero, or, because of the constraint, a stationary point on the boundary, where the gradient vector is perpendicular to the boundary tangent plane. A computational algorithm is developed that performs the operations of the method. Both one- and two-dimensional numerical filter problems are presented to demonstrate the usefulness of the algorithm to the problem of estimating spectral parameters. Dissert. Abstr.

N75-21515 New Mexico Univ., Albuquerque.
A BIQUADRATIC REALIZATION USING A DISTRIBUTED-LUMPED-ACTIVE RC NETWORK Ph.D. Thesis
James Lee Jorgensen 1974 175 p Sponsored by ERDA
Avail: Univ. Microfilms Order No. 75-6968

An analysis and a description was given of a distributed lumped active (DLA) RC network that approximately realizes a general BVTF (biquadratic voltage transfer function) and meets criteria of simplicity and practicality. This DLA network uses a single voltage controlled voltage source (VCVS) with gain between 0 and 2 as the active element, and two uniformly distributed RC (URC) lines with equal RC products and either a single resistor or capacitor as the passive elements. Since the VCVS is located at the output of this network, it can, therefore, be cascaded to realize higher order active filters. The voltage transfer function of this DLA network has, in general, an infinite number of poles and zeros. The approximation to a BVTF is made by locating the two poles and two zeros nearest to the origin of the s-plane at the desired BVTF pole and zero locations. The synthesis method derived for this network is based on numerically generated s-plane pole-zero design charts. Dissert. Abstr.

N75-21516 Utah Univ., Salt Lake City.
DISTRIBUTED MICROWAVE AMPLIFICATION IN LONG EPITAXIAL LAYERS OF GALLIUM ARSENIDE Ph.D. Thesis
Larry Samuel Metz 1974 188 p
Avail: Univ. Microfilms Order No. 75-5179

A new type of Gunn amplification is investigated which uses a resistive layer in conjunction with an n-type gallium arsenide epitaxial layer to obtain broadband microwave gain. The resistive layer scheme is shown capable of biasing arbitrarily long lengths of epilayer above the Gunn effect threshold, allowing more geometrical freedom for sophisticated coupling schemes. Microwave gain is argued to occur by propagating space charge wave modes that have gain in spite of the presence of the lossy resistive layer. Three basic geometries are investigated using RF perturbation methods, and the low frequency biasing characteristics of each are verified by a novel computer program using the Fast Fourier Transform. As a sideline, the FFT solves Poisson's equation in simple geometries and is argued to save considerable time and storage for large grid sizes.
Dissert. Abstr.

N75-21517# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
AN ACCURATE dc MOTOR SPEED CONTROL SYSTEM
L. Stellema Oct. 1974 13 p ref
(ATN-7406) Avail: NTIS HC $3.25

A dc motor speed control system that uses an oscillator as a frequency reference is described. It provides control with an accuracy determined solely by that of the oscillator. The motor drives a disk with 72 holes which are counted down in a 12 stage binary up/down counter. The cycles of the reference oscillator signal are counted up in the same counter. The motor is energized when the output of the most significant binary state is low, that is for counts 0 to 2047 and switched off for counts 2048 to 4095, and will lock in at the reference frequency. When the motor is synchronized, the count jumps from 2047 to 2048 and back, 72 times per revolution, causing the motor to be switched on and off at that rate. Author

N75-21518*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FREQUENCY MODULATED OSCILLATOR Patent Application
Martial A. Honnell, inventor (to NASA) (Auburn Univ.) Filed 9 Apr. 1975 11 p Sponsored by NASA
(NASA-Case-MFS-23181-1; US-Patent-Appl-SN-566495) Avail: NTIS HC $3.25 CSCL 09A

Devices for frequency modulation of radio frequency oscillators are described. In particular, a description is given of a frequency modulated push-pull oscillator in which the nonlinear characteristics of varactors producing frequency modulation is compensated for by an opposite nonlinear characteristic of a field effect transistor providing bias to the varactors. NASA

N75-21519# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF OPERATION OF THE SOLENOID INSTALLATION
V. G. Veselago, L. P. Maksimov, and A. M. Prokhorov 9 Apr. 1975 10 p refs Transl. into ENGLISH from Tr. Ordena Lenina Fiz. Inst. Im. P. N. Lebedev (Moscow), v. 67, 1973 p 3-7
(JPRS-64513) Avail: NTIS HC $3.25

A description is given of the operation of the Solenoid installation. The installation is designed exclusively to conduct physical investigations. Author

N75-21520*# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
THE SOLID-STATE Ku-BAND POWER AMPLIFIER Final Report, Aug. 1971 - Aug. 1974
B. D. Geller 10 Feb. 1975 140 p refs
(Contract NAS5-20291)
(NASA-CR-143722) Avail: NTIS HC $5.75 CSCL 09C

A survey of IMPATT diodes and negative resistance amplifiers is presented. The first phase of the amplifier effort is discussed in which a single diode reflection amplifier delivering 0.5 watt at 15 GHz with 10-dB gain over a 1-GHz band was developed. The design of a dominant mode resonant combiner is described along with the characterization of the IMPATT diodes. Results are given on the complete amplifier and on the thermal and graceful failure characteristics of the unit. Author

N75-21521*# Radio Corp. of America, Princeton, N.J.
DESIGN, PROCESSING, AND TESTING OF LSI ARRAYS FOR SPACE STATION Quarterly Technical Report, 1 Oct. - 31 Dec. 1974
W. C. Schneider Mar. 1975 19 p ref
(Contract NAS12-2207)
(NASA-CR-120735; PRRL-75-CR-20; QTR-16) Avail: NTIS HC $3.25 CSCL 09/5

Data for the beam-leaded silicon-on-sapphire (SOS) process using the TA5388 dual-complementary pair plus inverted circuit show the stability of the dc device characteristics through the complete beam-lead processing and packaging steps. A more complex circuit, the TA6567 - a silicon-gate, voltage-sense BL/CMOS/SOS 256-bit RAM, has also been made that was functionally perfect at wafer probe. Efforts to increase the yield of this circuit and to obtain electrically perfect packaged units are discussed. Author

N75-21522*# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
AEROSPACE TECHNOLOGY DEVELOPMENT OF THREE TYPES OF SOLID STATE REMOTE POWER CONTROLLERS FOR 120VDC WITH CURRENT RATINGS OF FIVE, AND THIRTY AMPERES, ONE TYPE HAVING CURRENT LIMITING Interim Report
D. E. Baker Feb. 1975 186 p
(Contract NAS3-17771)
(NASA-CR-134772; WAED-75-01E) Avail: NTIS HC $7.00 CSCL 09C

The first generation of remote power controllers (RPC) developed included: a 5-ampere design (Type 1), capable of limiting maximum overload current to 15 amperes for .1 sec; and 5-ampere noncurrent (Type 2) and 30-ampere noncurrent (Type 3) limiting designs, both with selectable instant trip levels for high-current overload. Each design provides overcurrent protection through an inverse I squared T trip-out function with an automatic reset option and demonstrates step-applied fault

capability with a 4000-ampere surge, fast-risetime (low-inductance) power source. They also meet MIL - STD - 461A specification for electromagnetic interference. The second generation RPCs traded off specification compliance for reduction in cost and complexity for the Type 1 and 2 designs and give comparable or improved performance in most areas. The noncurrent limiting RPC proved to be a more economical and feasible method of overload protection for certain load types.
Author

N75-21523# Los Alamos Scientific Lab., N.Mex.
DEVELOPMENT OF A SUPERCONDUCTING SWITCH FOR MAGNETIC ENERGY STORAGE SYSTEMS
J. D. G. Lindsay, D. J. Blevins, H. L. Laquer, G. A. Miranda, J. D. Rogers, C. E. Swannack, and D. M. Weldon Sep. 1974 5 p refs Presented at Applied Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1429; Conf-740957-2) Avail: NTIS HC $3.25

Empirical rules are given which assure that a switch is driven fully normal when triggered, and some of the possible geometrical arrangements for switches are considered. Results of energy transfer experiments from 20 kJ and 300 kJ superconducting energy storage systems using superconducting switches are given. Author (NSA)

N75-21524# Joint Inst. for Nuclear Research, Dubna (USSR).
SOME PECULIARITIES OF OPERATION OF CURRENT COMMUTATOR ON INDUCTIVE LOAD
L. S. Barabash, S. M. Bilskii, and V. A. Timokhin 1974 16 p refs In RUSSIAN
(JINR-P9-7773) Avail: ERDA Depository Libraries HC $4.00

Results of investigations on thyristors, used for forming pulsed magnetic fields, are presented. The peculiarities of the schemes with the inductive load which use a series connection of thyristors and diodes are described. Author (NSA)

N75-21525# Bhabha Atomic Research Centre, Bombay (India).
TEST EQUIPMENT AND DISPLAY SYSTEMS, SECTION ELECTRONICS DIVISION, 1972
1973 32 p
(BARC-725) Avail: ERDA Depository Libraries HC $4.75

The activities of the Test Equipment and Display Systems Section of Electronics Division are briefly discussed under the categories: (a) test equipment for the measurement, calibration and standardization of the electronic equipment both for nuclear and non-nuclear applications; (b) display system for BARC, industry, and medicine; (c) medical electronics; (d) instrumentation for the analysis and monitoring of bio-electric potentials; and (e) instrumentation systems for other agencies on request, e.g., automatic warning system for railways etc. Author (NSA)

N75-21526# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
DIFFUSION OVEN CONTROL: MODELIZATION AND IDENTIFICATION Ph.D. Thesis - Toulouse Univ. [CONTRIBUTION A L'ETUDE D'UN FOUR A DIFFUSION: MODELISATION, IDENTIFICATION]
Luis Humberto SarmientoSuescun 1973 114 p refs In FRENCH
(LAAS-Publ-1082) Avail: NTIS HC $5.25

The corresponding dynamic model was linearized around the equilibrium temperature profile and transformed by Galerkin approximation in a sixth order differential equations system. Some unknown coefficients were determined using six temperature measurements while perturbing the heat input and using nonlinear filtering. Numerical, real time command and control was used, for which various interfacing electronic packages were built. Their characteristics are detailed together with the necessary software for data acquisition and processing. Some steps towards a suboptimal algorithm conception were taken using closed loops and a quadratic criterion on the state vector and system command. ESRO

N75-21527# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
NUMERICAL COMMAND AND CONTROL FOR A DIFFUSION OVEN Ph.D. Thesis - Toulouse Univ. [ETUDE D'UNE COMMANDE NUMERIQUE D'UN FOUR A DIFFUSION]
Alain Bergeaud 1974 101 p refs In FRENCH
(LAAS-Publ-1194) Avail: NTIS HC $5.25

A command and control law is determined by minimization of a quadratic criterion in regard to a linear partial differential system. This law is for a diffusion oven used in electric component fabrication where a temperature plateau along the oven is sought. Using functional approximation methods, the problem was reduced to that of finite dimension system with state reconstruction when all the state vector components are not measurable. The mathematical model emerging from energetic budget considerations uses nonlinear output filtering for specification of the unknown parameters. ESRO

N75-21528# Naval Research Lab., Washington, D.C.
COMPUTER ANALYSIS OF CONFORMAL PHASE ARRAYS
J. K. Hsiao and J. B. L. Rao 15 Nov. 1974 41 p refs
(NRL Proj. R02-24; WF09905020)
(AD-A002732; NRL-7826) Avail: NTIS CSCL 09/5

A systematic method of analyzing conformal arrays on a general surface is described. A computer program is included in this report along with the necessary subroutines. By using proper input data cards and the subroutines, the program can be used for the arrays on a general conformal surface or well-defined surface like that of a circular cylinder, circular torus, cone, or a plane. The computer output includes a printout and a plot of the radiation patterns. Crosspolarization, if any, will be plotted on the same curve. GRA

N75-21529# Raytheon Co., Norwood, Mass.
A PROGRAMMABLE SURFACE WAVE ULTRASONIC MATCHED FILTER Final Report, Nov. 1971 - Jul. 1974
Manfred G. Unkauf, Manfred B. Schulz, and John B. Gadoury, II Oct. 1974 121 p refs
(Contract F30602-72-C-0095)
(AD-A002837; RADC-TR-74-260) Avail: NTIS CSCL 09/5

A new spread spectrum transmission technique is described which can efficiently convey information in asynchronous bursts. Theoretical predictions are provided to establish the baseline performance of this technique for the special case where 8 data bits are transmitted in each burst. The implementation of an experimental simplex transmission system is described which makes extensive use of Surface Acoustic Wave (SAW) devices for signal generation and matched filter detection. The design and experimental performance is displayed for the state-of-the-art SAW devices as well as the entire simplex system. It is shown that eight SAW filters capable of generating 127 chip pseudo-noise codes at a 50 MHz chip rate can be coherently combined into a single burst and also matched filter demodulated. It is further shown that discrete addressing of the transmitted bursts can be accomplished by permutation of the order of transmission of the 8 individual codes within a burst. GRA

N75-21530# TRW, Inc., Lawndale, Calif. Semiconductor Div.
PRODUCTION ENGINEERING MEASURE FOR AN INTEGRATED CIRCUIT POWER AMPLIFIER 600-1000 MHz FOR TACTICAL RADIO EQUIPMENT Quarterly Report, 1 Apr. - 30 Sep. 1974
Roger C. DeBloois Sep. 1974 22 p
(Contract DAAB05-72-C-5844)
(AD-A003313; QR-9; QR-10) Avail: NTIS CSCL 09/5

The project is intended to provide for production engineering to manufacture an amplifier with the following characteristics: 30 watts output power; input impedance, 50 ohms; output impedance, 50 ohms; frequency band, 600-1000 MHz. The amplifier will use the TRW MICroAMP broadband transistor which will be optimized as part of this project. Two of these devices will then be combined using 90 degree interdigitated couplers to produce a minimum of 30 watts of power. This amplifier will be adaptable for use as a building block for the fabrication of higher power systems. Batch processing techniques continued to be improved and fabrication processes of the contract amplifier housings were re-evaluated in the area of proper plating to assure good solderability, hermeticity, and appearance. GRA

N75-21531# LNR Communications, Inc., Hauppauge, N.Y.
WIDE BAND IMAGE RECOVERY MIXER Final Report, Oct. 1972 - Mar. 1974
Alexander J. Kelly and Herman C. Kean Nov. 1974 74 p refs
(Contract F30602-73-C-0068)
(AD-A003337; RADC-TR-74-296) Avail: NTIS CSCL 09/5

The program was aimed at achieving broadband low noise superheterodyne receiver front ends, without the expense and complexity of using low noise preamplifiers at the signal frequency. The approach was based on recovery of mixer generated image power to obtain reduced mixer conversion loss. A mathematical model for analyzing the image recovery mixer was derived, using scattering parameters and signal flow graph techniques. Based on the analysis, experimental model X-band mixers with I.F. preamplifiers were constructed in both strip line and microstrip circuitry. A noise figure ranging between 4.1 and 4.8 db was achieved over nearly 1 GHz of band width. This represents a one to two db improvement over X-band tunnel diode amplifiers. In addition to offering improved sensitivity, the image recovery mixer-preamplifier provides improved dynamic range and lower cost as compared to a tunnel diode amplifier. GRA

N75-21532# National Bureau of Standards, Washington, D.C. Electronic Technology Div.
TABULATION OF PUBLISHED DATA ON ELECTRON DEVICES OF THE USSR THROUGH DECEMBER 1973 Final Technical Note
Charles P. Marsden Nov. 1974 133 p Supersedes NBS-TN-715, COM-72-50665
(COM-74-51229/4; NBS-TN-835; NBS-TN-715; COM-72-50665; LC-74-600094) Avail: NTIS MF $2.25; SOD HC $1.95 as C13.46:835 CSCL 09A

The tabulation includes published data on U.S.S.R. electron devices as collected from publications, mostly handbooks, published by the various ministries and institutes of the U.S.S.R. Information is given on all active devices ranging from receiving to microwave devices, semiconductor devices, and miscellaneous devices such as photographic flash tubes and thermistors. GRA

N75-21533# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
HIGH EFFICIENCY DUAL MODE OCTAVE BANDWIDTH TRAVELING WAVE TUBE Interim Technical Report, Jan. - Jun. 1974
Arthur E. Manoly and Mark K. Scherba Nov. 1974 27 p
(Contract F30602-74-C-0099)
(AD-A002845; EDD-W-4388; RADC-TR-74-282) Avail: NTIS CSCL 09/1

Techniques resulting in high overall efficiency over extended bandwidths have been considered in this study effort. The study was complicated by both the high average power requirement and the 10 db pulse up dual mode capability plus PPM focusing. Experimental cold testing dealing with helices of different pitch was performed. Suitable shaping methods resulted in high interaction impedances with small phase velocity variations over octave bandwidths. Large signal computer evaluations considering beam-circuit wave velocity resynchronization schemes were conducted. An existing experimental dual mode electron gun was scaled and structurally adapted for PPM focusing. A satisfactory match was designed and demonstrated for both input and output transducers. GRA

N75-21534# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE VEM-6 AND VEM-10 ELECTROMAGNETIC RELAYS
E. I. Bykov and A. M. Koluzaev 21 Nov. 1974 115 p refs Transl. into ENGLISH from Biblioteka Elektromontera (USSR), no. 376, 1973 p 1-104
(AD-A002884; FTD-HC-23-1366-74) Avail: NTIS CSCL 09/1

The publication gives basic information about electromagnetic relays. The construction details are discussed, their commutation properties are appraised, and recommendations for improving the reliability of their operation are given. The problems of assemblage, exploitation, and overhaul of these apparatus uses are discussed. GRA

N75-21535# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTROMAGNETIC INTERFERENCE BETWEEN SYMMETRIC AND COAXIAL CIRCUITS IN COMBINED CABLES
I. I. Grodnev, M. A. Klimov, and V. M. Kovrigo 20 Nov. 1974 21 p refs Transl. into ENGLISH from Tr. Uchebnykh Inst. Svyazi (USSR), no. 53, 1971 p 141-151
(FTD Proj. T74-02-16)
(AD-A003100; FTD-MT-24-2159-74) Avail: NTIS CSCL 09/1

The frequency dependence of crosstalk attenuation is investigated. GRA

N75-21536# Army Electronics Command, Fort Monmouth, N.J.
PROCEEDINGS OF THE INTERNATIONAL WIRE AND CABLE SYMPOSIUM (23RD)
5 Dec. 1974 435 p refs Symp. held at Atlantic City, 3-5 Dec. 1974
(AD-A003251) Avail: NTIS CSCL 09/1

Topics discussed include the effects of EMP on cable systems, design and manufacturing techniques, polyolefins, filled and polyolefin cables, flat cable technology and connections, coaxial cables, telephone cable design, matrix systems and optical transmission cables, cable construction testing and materials conservation, extrusion and process control, and telephone cable applications. GRA

N75-21537# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE OPTIMUM PREVENTIVE MAINTENANCE OF ELECTRONIC SYSTEMS
G. G. Manshin 10 Dec. 1974 38 p refs Transl. into ENGLISH from the book "Vychislitelnaya Tekhnika v Mashinostroenii" Minsk, Sep. 1969 p 187-198
(AD-A002816; FTD-MT-24-193-75) Avail: NTIS CSCL 09/3

A method is proposed for the determination of the optimum periodicity of preventive maintenance from the criteria for reliability failure rate and for cost (labor expense of maintenance). GRA

N75-21538# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HIGH FREQUENCY METHODS OF MEASURING DIELECTRIC PROPERTIES OF CONDENSED SUBSTANCES BEHIND SHOCK WAVE FRONT
V. V. Yakushev, S. S. Nabatov, and A. N. Dremin 19 Nov. 1974 16 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd. vo Nauka, 1972 p 584-590
(AD-A003044; FTD-HT-23-1994-74) Avail: NTIS CSCL 07/4

Permittivity and dielectric losses are closely related to the microstructure of the dielectric, the magnitude of the dipole moment of the molecules, relaxation times of polarization, etc. It is interesting to use dielectric measurements in shock compression experiments to explain the mechanism of the simultaneous effect of high dynamic pressures and temperatures on a substance. Proposed in the present report are two high-frequency methods of measuring the dielectric properties of condensed substances behind a shock wave front - the amplitude method and the oscillatory circuit method. The idea of the experiments was to measure the capacitance of a plane capacitor filled with a dielectric under conditions of single-stage shock compression. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-21539 Lehigh Univ., Bethlehem, Pa.
OSCILLATING TURBULENT FLOW IN A CONICAL DIFFUSER Ph.D. Thesis
Andreas Albert Schachenmann 1974 244 p
Avail: Univ. Microfilms Order No. 75-4736

Oscillatory flow in a diffuser was investigated experimen-

tally as well as theoretically. Measurements were made of the amplitude and phase of velocity and pressure oscillations in the diffuser core, using a PDP8/E computer system to obtain ensemble averages of the flow parameters. The theoretical analysis of the diffuser core flow included the influence of the flow area blockage variation on the core flow behavior, and resulted in numerical predictions of velocity and pressure fluctuation amplitudes and phases in the diffuser core. Detailed measurements were made of the oscillating diffuser wall boundary layer. Mean velocity, rms of the total velocity fluctuation, and ensemble averages of the oscillating velocity component were measured throughout the boundary layer. It was observed that in adverse pressure gradients, substantial amplification of the velocity amplitude within the boundary layer relative to the local free stream amplitude can occur. Dissert. Abstr.

N75-21540 Duke Univ., Durham, N.C.
FLOW IN SPHERICAL ANNULUS Ph.D. Thesis
Muhsin Menguturk 1974 208 p
Avail: Univ. Microfilms Order No. 75-2442

Theoretical and experimental results are presented for the flow of a viscous incompressible fluid in a spherical annulus consisting of the region between spherical surfaces which rotate about a common axis. Results concerning the laminar flow, flow stability, and turbulent flow in concentric and eccentric annuli are presented. Flow visualization studies and torque measurements for the stationary outer sphere case indicate that the basic laminar flow (primary and secondary flow) in concentric or eccentric spherical annuli is as previously predicted. The character of the flow is dependent upon the Reynolds number, the ratio of the radii of the two spheres and the eccentricity ratio. Linear hydrodynamic stability theory is applied to the concentric spherical geometry flow and a critical Reynolds number is obtained for various radius ratios and angular velocity ratios. These results are obtained by using a toroidal-poloidal field representation of the disturbance motion and a numerical integration of the governing equations. Dissert. Abstr.

N75-21541 Colorado Univ., Boulder.
STUDIES OF VISCOUS FLOWS SEPARATED BY MASS ADDITION Ph.D. Thesis
Abdel-Fattah Amr 1974 176 p
Avail: Univ. Microfilms Order No. 75-3754

Various problems were studied to illustrate the effects of mass addition on the flow configuration in the boundary layer, in particular for configurations such that the classical boundary layer is no longer valid. A foreign gas was injected with a similarity distribution along a flat plate into a compressible uniform flow to insure the separation of the boundary layer. An interaction theory was constructed which describes the effect of Mach number, wall temperature, and injectant gas on the skin friction, wall heat transfer, and onset of separation. The effects of gas injection at a rate of an order of magnitude greater than that allowed by the classical boundary layer were studied along with the effects of mass addition on boundary layer thickness and skin friction. The effects of injection cut-off were investigated, and an interaction theory was constructed to describe the reattachment of the separated boundary layer to the surface. The uniform flow past a semi-infinite plate with similar injection and an attached boundary layer is described. Dissert. Abstr.

N75-21542 Oklahoma Univ., Norman.
HEAT TRANSFER ASPECTS OF CRYOGENIC LIQUID SPILLS Ph.D. Thesis
Ching Se Yen 1974 193 p
Avail: Univ. Microfilms Order No. 75-2990

A quasilinearization alternating-direction implicit numerical method was proposed to solve the differential equations that result from analysis of one- and two-dimensional heat conduction problems with phase change. The finite difference equations of these problems were derived from applying heat and material balances to discrete physical mesh regions rather than from applying an arbitrary finite difference approximation to the partial differential equations. The latent heat was approximated by an error function over this interval. The proposed method can deal with nonlinear boundary conditions and composite media without undue effort. The effects of the heat transfer coefficient between soil and liquefied natural gas (LNG), thermal properties of soil, and latent heat of phase change on the boil-off rate of LNG spilled on soil were studied. The temperature distribution and the location of soil phase change were also examined. A mathematical model for the heat transfer effects accompanying the application of high expansion foam on LNG spills on land was also developed. Dissert. Abstr.

N75-21543 Texas A&M Univ., College Station.
A NUMERICAL METHOD FOR SOLVING THE GENERALIZED HEAT CONDUCTION EQUATION Ph.D. Thesis
James Michael Walker 1974 94 p
Avail: Univ. Microfilms Order No. 75-2903

A general shaped one-dimensional heat conducting body with side convection in a condition of steady state is formulated numerically, in dimensionless form, by dividing the body into elements and considering an energy balance for each element. The equations for each element are arranged such that the most advanced point in the grid is represented in terms of the preceding points. In this way all of the unknown dimensionless temperatures in the body are expressed in terms of one unknown dimensionless temperature which is readily determined, thus enabling the calculation of all other temperatures. This formulation approach is expanded first to include transient states with internal energy generation and finally to include multi-dimensional bodies in both transient and steady states. The data obtained include both temperature distributions and heat fluxes in dimensionless form for a body conducting heat away from a constant temperature source and convecting it to some surrounding medium. Dissert. Abstr.

N75-21544 Pittsburgh Univ., Pa.
APPROXIMATIONS IN FINITE ELEMENT HEAT CONDUCTION ANALYSIS Ph.D. Thesis
Satyananda Charrabarti 1974 149 p
Avail: Univ. Microfilms Order No. 75-4097

Methods which might accelerate the finite element process and, decrease the computer costs were developed. Three particular areas of improvement were tried: one, a study of efficiency and accuracy using modifications possible in the generation of a quadrilateral element from linear temperature triangular elements; two, ordered elimination of internal node points in order to obtain a reduction in the sizes of the final matrices through use of condensation technique; and, three, a formulation called the finite strip technique specially suitable for rectangular areas and having two of its opposite ends either insulated or kept at a constant temperature. The results of the analysis under the first category indicate that the use of the lumped specific heat matrices produces an appreciable reduction in the computer execution time over the use of the consistent specific heat matrix. Dissert. Abstr.

N75-21545 Colorado Univ., Boulder.
LINEAR HYDRODYNAMIC STABILITY THEORY FOR THIN FILM FLOW DOWN CONES AND CYLINDERS Ph.D. Thesis
Richard Lee Zollars 1974 188 p
Avail: Univ. Microfilms Order No. 75-3851

The effect of the nonparallel nature of the basic flow on the stability of thin film flow down a cone is studied. The resulting basic flow equations and also the linearized stability equations are partial differential equations, in contrast to the classical stability studies where these equations are ordinary differential equations. An analytical solution to the linear stability problem for a nonparallel film flow was obtained using a regular perturbation expansion in a small parameter which is a measure of the characteristic length for diffusion of vorticity in the cross stream direction to the characteristic length in the streamwise direction. Dissert. Abstr.

N75-21546 Virginia Polytechnic Inst. and State Univ., Blacksburg.
UNSTEADY BOUNDARY LAYERS AND SEPARATION Ph.D. Thesis
Demosthenes Theodoros Tsahalis 1975 170 p
Avail: Univ. Microfilms Order No. 75-3471

A method was developed to solve numerically the unsteady, two-dimensional, incompressible, boundary-layer equations with arbitrary pressure gradients, capable of integrating through the point of zero skin friction into partially reversed flow. The properties of the boundary layer flow and separation in unsteady flows are

studied in detail. The path of zero skin friction and separation singularity with respect to time was determined. Comparison of the numerical results with existing analytical, numerical and experimental results was made whenever possible. It is shown that the point of zero skin friction should not be a downstream limit of the boundary layer calculation in unsteady flow. Most of the features of separation predicted by the Sears-Telionis model of unsteady separation are found to be present. Certain characteristic properties of unsteady viscous flow, like vorticity diffusion, steady streaming, etc., are also studied in detail.
Dissert. Abstr.

N75-21547 Texas Univ., Austin.
NUMERICAL SIMULATION OF DEVELOPMENT OF SOLUTION-MINED STORAGE CAVITIES Ph.D. Thesis
Ahmad Saberian 1974 238 p
Avail: Univ. Microfilms Order No. 75-4449

The flow mechanism in solution-mined cavity being developed by water circulation varies as the operation continues. In the beginning the flow is described as an annulus flow with convective transfer (dissolution) of salt to the flow. At later times the flow and mass transfer processes are dominated by buoyancy. The rise of water in brine around the periphery of a vertical tube was studied in a a 5' tall cylindrical model (confined plume rise). The plume velocities and radii were measured by heat anemometry and shadowgraph techniques. The effect of salt surface inclination on the rate of dissolution was experimentally determined. Based on the results of the above studies and previous work, a numerical model was developed capable of simulating the washing of a single cavity in homogeneous salt at constant temperature for either reverse or direct circulation with variable rates of injection. The model's predictions compared satisfactorily with field data. Dissert. Abstr.

N75-21548 Washington Univ., Seattle.
HEAT CAPACITY STUDIES OF SUBMONOLAYER HELIUM FILMS ON GRAFOIL Ph.D. Thesis
Susanne Vera Hering 1974 84 p
Avail: Univ. Microfilms Order No. 75-3995

The heat capacity of submonolayer helium films adsorbed on a graphite substrate were measured. For films of the He-3 isotope, the study was made in a temperature range of .05 to 4 K for densities, n, of .0055 to .0220 and .070 to .092 particles per square Angstrom, the heat capacity exhibits a group of phase transitions, analogous to those previously observed for He-4 films, which are attributed to the melting of a two dimensional solid phase. For slightly lower film densities, there is a sharp peak in the heat capacity just above 1 K. Measurements made of the He-4 isotope show a similar group of one degree transitions in the same density range. As with the lighter isotope, the melting line of He-4 is also found to extend to a lower density. No definite identification of the one degree transitions was made. Consideration is given to a two phase coexistence with the previously studied lower density ordered phase, and to the formation of a new phase. Dissert. Abstr.

N75-21549 Ohio State Univ., Columbus.
A THEORETICAL ANALYSIS OF ACCELERATING REACTION WAVES AND DETONATION INDUCTION DISTANCES Ph.D. Thesis
Mario Anthony Colaluca 1974 130 p
Avail: Univ. Microfilms Order No. 75-3031

A theoretical model is developed to predict the acceleration of deflagration waves in one-dimensional gaseous systems. Detonations are predicted along with how far the deflagration wave travels before the detonation occurs for given composition of the initial mixture, initial temperature and pressure, and the surface condition of the detonation tube. The acceleration process is approximated by a series of quasi-steady steps. At each step, the unsteady nature of the problem is investigated separately from the irreversible effects. It is postulated that the time required to go from one step to the next is controlled by the time required to establish turbulent flow in the boundary layer. A continuous reaction wave acceleration process results. The reaction wave acceleration velocity is determined along with the distance traveled by the reaction wave. Dissert. Abstr.

N75-21550 Delaware Univ., Newark.
INTEGRAL ANALYSIS OF BOUNDARY LAYER ON MOVING WALL AND ITS APPLICATION TO A SPINNING CYLINDER IN CROSSFLOW Ph.D. Thesis
Kevin Spain Fansler 1974 300 p
Avail: Univ. Microfilms Order No. 74-26130

An integral method for calculating the nonsimilar two-dimensional boundary layer development and separation on both upstream and downstream moving walls was developed. The integral-momentum and integral-energy boundary layer equations were integrated simultaneously by using the shape factor relationships of the moving-wall similarity solutions. The technique was applied to a source-wake bound-vortex model of the inviscid flow about a spinning cylinder. Utilizing an iterative process, agreement was obtained between the separation points found by the boundary layer calculation and the locations of separation for the inviscid flow model. Lift and drag coefficients were calculated as a function of cylinder rotation rate and compared with experiment. Dissert. Abstr.

N75-21551 Maryland Univ., College Park.
A NUMERICAL STUDY OF VISCOUS FLOWS OF STABLY STRATIFIED FLUIDS OVER BARRIERS Ph.D. Thesis
Henry Jacob Haussling 1974 85 p
Avail: Univ. Microfilms Order No. 75-7332

Numerical techniques for integrating the Navier-Stokes equations which have proven useful in the study of homogeneous viscous flows are extended to handle the flow of a stably stratified viscous fluid over an infinitely long ridge. The flow is considered to be time-dependent and arbitrary initial conditions are employed. Almost steady-state solutions are computed for Re = 10 with Ri = 0, 0.25, 2, and 4; and Re = 100 with Ri = 0.25, where Re and Ri are the Reynolds and Richardson numbers, respectively. An almost periodic solution is found for Re = 100 with Ri = 2. Two basic velocity profiles are used to demonstrate the dependence of the flow characteristics on the basic flow. Dissert. Abstr.

N75-21552 Missouri Univ., Columbia.
THE VISCOSITY OF AMMONIA AT 175 TO 325 C AND PRESSURE TO 120 ATMOSPHERES Ph.D. Thesis
Summer B. K. Sun 1974 120 p
Avail: Univ. Microfilms Order No. 75-5798

The viscosity of ammonia gas was measured using a steady flow capillary viscometer at temperatures of 175 C, 200 C, 250 C, 300 C and 325 C and at pressures up to 120 atm with an estimated accuracy of + or - 0.4%. The measured values agree within 0.5% of the interpolated values obtained on 138, 171 and 204 C isotherms and pressure up to 120 atm. The Chapman-Enskog solution of the Boltzmann equation with the canonically preaveraged spherical shell plus dipole-dipole potential function was used to represent the extrapolated low density viscosity data and the second virial coefficient data for five polar gases. No single set of potential function parameters was found which represented both the viscosity data and second virial coefficient data for a polar gas within the experimental accuracy of the measurements. The residual viscosity correlation accurately represents all of the ammonia data obtained within the experimental error of the measurements. Dissert. Abstr.

N75-21553 New Mexico Univ., Albuquerque.
DISPERSION IN LAMINAR FLOW OF NON-NEWTONIAN FLUIDS Ph.D. Thesis
Subhash Nandlal Shah 1974 168 p
Avail: Univ. Microfilms Order No. 75-6978

Taylor's analysis of the dispersion of solutes in laminar flow of a Newtonian fluid through a circular tube was extended to the case of a non-Newtonian Eyring model fluid. An approach was taken to solve the convective diffusion equation for the Eyring model fluid, which incorporates the use of the dimensionless longitudinal pressure gradient and the mean velocity to obtain the dimensionless concentration. A solution of the diffusion equation was obtained for quantities such as the dimensionless concentration, mean concentration, and effective dispersion coefficient as a function of a dimensionless parameter describing the fluid. Experiments were conducted with fluids possessing non-Newtonian characteristics to obtain rheological and dispersion data. Dispersion measurements were made with a Newtonian

system in a 1 mm tube. Displacement experiments were performed with a non-Newtonian system. The results from experimental measurements showed good agreement with the numerical and Taylor-Fan approximate solutions of the diffusion equation. The value of diffusion coefficient is concentration dependent as expected. Dissert. Abstr.

N75-21554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL DOCUMENTATION OF A HYPERSONIC SHOCK-WAVE TURBULENT BOUNDARY LAYER INTERACTION FLOW: WITH AND WITHOUT SEPARATION
M. I. Kussoy and C. C. Horstmann Feb. 1975 67 p refs
(NASA-TM-X-62412; A-5910) Avail: NTIS HC $4.25 CSCL 20D

An experiment, thoroughly documenting the flow field resulting from the interaction of a shock wave with a nonadiabatic hypersonic turbulent boundary layer, is described. Detailed mean flow and surface data are presented for two shock strengths resulting in attached and separated flows, respectively. The surface measurements include continuous pressure, shear and heat-flux distributions upstream, in, and downstream of the interaction regions. At closely spaced intervals along the surface, boundary-layer profiles of static and pitot pressure and total temperature were obtained from which velocity, density and static temperature profiles were derived. The data are presented in both graphical and tabular form. These data are of sufficient detail to validate advanced computer codes and their associated turbulence models. Author

N75-21555*# Pennsylvania State Univ., University Park.
[RESEARCH ON FLUIDICS, VALVES, AND PROPORTIONAL AMPLIFIERS]
Oct. 1974 12 p refs Sponsored in cooperation with the Harry Diamond Labs.
(Grant NGL-39-009-023)
(NASA-CR-142645; RR-17; PSU-SCL-17(74)) Avail: NTIS HC $3.25 CSCL 13G

Research and development being conducted at the Systems and Controls Laboratory is reviewed. Static characteristics (supply, input, transfer, output, and noise characteristics) of laminar proportional amplifiers were investigated. Other topics discussed include velocity profiles for laminar fluidic jets, speed control systems employing a jet pipe valve, and power amplification with a vortex valve. M.J.S.

N75-21556*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF A FINITE DIFFERENCE TECHNIQUE TO THERMAL WAVE PROPAGATION
Kenneth J. Baumeister 1975 24 p refs To be presented at the Heat Transfer Conf., San Francisco, 11-13 Aug. 1975; sponsored by the ASME and the Am. Inst. of Chem. Engr.
(NASA-TM-X-71690; E-8291) Avail: NTIS HC $3.25 CSCL 20D

A finite difference formulation is presented for thermal wave propagation resulting from periodic heat sources. The numerical technique can handle complex problems that might result from variable thermal diffusivity, such as heat flow in the earth with ice and snow layers. In the numerical analysis, the continuous temperature field is represented by a series of grid points at which the temperature is separated into real and imaginary terms. Computer routines previously developed for acoustic wave propagation are utilized in the solution for the temperatures. The calculation procedure is illustrated for the case of thermal wave propagation in a uniform property semi-infinite medium. Author

N75-21557*# Kanner (Leo) Associates, Redwood City, Calif.
DIFFERENCE SCHEMES OF IMPROVED ACCURACY FOR THE NUMERICAL SOLUTION OF SOME PROBLEMS IN AERODYNAMICS
A. I. Tolstykh Washington NASA Mar. 1975 16 p refs Transl. into ENGLISH from Uch. Zap. (USSR), v. 4, no. 2, 1973 p 36-44
(Contract NASw-2481)
(NASA-TT-F-16181) Avail: NTIS HC $3.25 CSCL 20D

A procedure is proposed for developing third-order implicit conservative difference schemes for calculating viscid and inviscid gas flows. The approximation accuracy and stability of these schemes are analyzed. The flow of an ideal gas behind the detached shock wave at a blunt body is calculated. Author

N75-21558*# Kanner (Leo) Associates, Redwood City, Calif.
AN EXPLICIT FINITE-DIFFERENCE SCHEME FOR SOLVING THE PROBLEMS OF FLOWS PAST BODIES BY THE FINITE DIFFERENCE METHOD
A. N. Minaylos Washington NASA Mar. 1975 13 p refs Transl. into ENGLISH from Uch. Zap. TsAGI (USSR), v. 3, no. 6, 1972 p 119-124
(Contract NASw-2481)
(NASA-TT-F-16193) Avail: NTIS HC $3.25 CSCL 20D

An explicit two-step finite-difference scheme with second-order accuracy in the determination of the spatial variables is proposed for solving the problems of flows past bodies. A distinguishing feature of the finite-difference scheme is the small number of arithmetical operations required for calculation of parameters at each of its predictor-corrector steps. Author

N75-21559*# Dynatherm Corp., Cockeysville, Md.
DESIGN, DEVELOPMENT AND TESTING OF A CRYOGENIC TEMPERATURE HEAT PIPE FOR THE ICICLE SYSTEM Final Technical Report
Donald S. Trimmer 31 May 1974 138 p
(Contract NAS5-21563)
(NASA-CR-143710; DTM-73-15) Avail: NTIS HC $5.75 CSCL 13A

An analytical model was formulated for a cryogenic heat pipe, and thermal and transport analyses were developed to predict the performance characteristics of various heat pipe designs. These analyses permitted optimization of various design parameters. A series of four breadboard heat pipes were fabricated and tested to provide inputs such as internal film coefficients, minimum capillary radii, and wick permeabilities which are required for the analyses. The results of instrumentation, charging, and testing of cryogenic heat pipes were applied to the prototype heat pipes. After a thorough design analysis of three potential heat pipe wicks (slab, artery, and axial groove), the first two were chosen for application to two prototype heat pipes. Detailed designs were made of the two heat pipes and the units were fabricated. Tests were conducted which verified the integrity and safety margin of the design to withstand the internal pressure at ambient temperature and fatigue of thermal cycling. During the acceptance testing in the vacuum chamber, no difficulty was experienced in priming the slab-wick heat pipe and it met the performance design requirements. The artery-wick heat pipe would not prime with nitrogen working fluid for any test conditions. Author

N75-21560# Lockheed Missiles and Space Co., Palo Alto, Calif.
NONSTATIONARY INCOMPRESSIBLE FLUID BOUNDARY LAYER
S. G. Slavchev [1975] 11 p refs Transl. into ENGLISH from Vestn. Leningrad. Univ., Mat. Mekh., Astron. (USSR), no. 19, 1973 p 114-123
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The time-development of the boundary layer was investigated along with the nonstationary flow of an ideal incompressible fluid in the neighborhood of the forward stagnation point of a wedge with an aperture angle. Boundary layer equations were solved under various boundary and initial conditions. M.J.S.

N75-21561# Lockheed Missiles and Space Co., Palo Alto, Calif.
HEAT EXCHANGE IN A LAYER OF DISPERSE MATERIAL WITH RADIAL FILTRATION
V. I. Aniskin and V. A. Rybaruk [1975] 6 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), v. 28, no. 1, 1975 p 5-10
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The problem of heat exchange with radial filtration of the heat carrier through the layer of disperse material was investigated. Results of the numerical solution of the problem are presented in graphs. M.J.S.

N75-21562*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
WORKING MODEL OF THE LONDON MOMENT READOUT SYSTEM Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
John Benjamin Hendricks and Gerald R. Karr Mar. 1975 38 p refs
(Contract NAS8-29316)
(NASA-CR-120736) Avail: NTIS HC $3.75 CSCL 13K

The operating characteristics of a porous plug which has liquid helium on one side and which is pumped on under vacuum on the other side are discussed. The system investigated consists of a container of liquid helium which is well isolated, and the only means for mass flow out of the container is through a plug mode of porous material. The plug was assumed to have liquid helium on the container side while the other side of the plug is evacuated. Three cases were considered: (1) perfect evacuation with zero pressure, (2) evacuation through a chocked orifice, and (3) evacuation through a long, small diameter pipe with heating. Mass flow rates were determined along with mass flow at temperature above the lambda point temperature. Solutions were obtained for normal and superfluid velocity. M.J.S.

N75-21563*# Oak Ridge National Lab., Tenn.
EVALUATION OF T-111 FORCED-CONVECTION LOOP TESTED WITH LITHIUM AT 1370 C
J. H. DeVan and E. L. Long, Jr. Apr. 1975 133 p refs
(NASA Order C-54555-B; Contract W-7405-eng-26)
(NASA-CR-134745; ORNL-TM-4775) Avail: NTIS HC $5.75

A T-111 alloy (Ta-8% W-2% Hf) forced-convection loop containing molten lithium was operated 3000 hr at a maximum temperature of 1370 C. Flow velocities up to 6.3 m/sec were used, and the results of this forced-convection loop are very similar to those observed in lower velocity thermal-convection loops of T-111 containing lithium. Weight changes were determined at 93 positions around the loop. The maximum dissolution rate occurred at the maximum wall temperature of the loop and was less than 1.3 microns/year. Mass transfer of hafnium, nitrogen, and, to a lesser extent, carbon occurred from the hotter to cooler regions. Exposed surfaces in the highest temperature region were found to be depleted in hafnium to a depth of 60 microns with no detectable change in tungsten content. There was some loss in room-temperature tensile strength for specimens exposed to lithium at 1370 C, attributable to depletion of hafnium and nitrogen and to attendant grain growth. Author

N75-21564*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBULENCE PROCESSES AND SIMPLE CLOSURE SCHEMES
R. G. Deissler 1975 23 p refs Presented at Fundamentals and Appl. of Turbulence Lecture, Tullahoma, Tenn., 21-25 Apr. 1975
(NASA-TM-X-71703; E-8312) Avail: NTIS HC $3.25 CSCL 20D

The closure problem in turbulence is reviewed, and some simple closure schemes are introduced. Processes occurring in turbulent flow are discussed on the basis of solutions for some elementary flows such as homogeneous turbulence with and without uniform shear. Closure by specification of initial conditions, and finally practical closure schemes for more complicated flows are considered. The latter include Reynolds stress, eddy viscosity, and mixing-length closures. Author

N75-21565*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROGRAM AND CHARTS FOR DETERMINING SHOCK TUBE, AND EXPANSION TUNNEL FLOW QUANTITIES FOR REAL AIR
Charles G. Miller, III and Sue E. Wilder Washington Feb. 1975 280 p refs
(NASA-TN-D-7752; L-9700) Avail: NTIS HC $8.75 CSCL 20D

A computer program in FORTRAN 4 language was written to determine shock tube, expansion tube, and expansion tunnel flow quantities for real-air test gas. This program permits, as input data, a number of possible combinations of flow quantities generally measured during a test. The versatility of the program is enhanced by the inclusion of such effects as a standing or totally reflected shock at the secondary diaphragm, theremochemical-equilibrium flow expansion and frozen flow expansion for the expansion tube and expansion tunnel, attenuation of the flow in traversing the acceleration section of the expansion tube, real air as the acceleration gas, and the effect of wall boundary layer on the acceleration section air flow. Charts which provide a rapid estimation of expansion tube performance prior to a test are included. Author

N75-21566*# Acurex Corp., Mountain View, Calif. Aerotherm Div.
RAPID METHODS FOR CALCULATING RADIATION TRANSPORT IN THE ENTRY ENVIRONMENT Final Report
William E. Nicolet Washington NASA Apr. 1975 58 p refs
(Contract NAS1-12160)
(NASA-CR-2528) Avail: NTIS HC $4.25 CSCL 20D

A procedure is developed for the prediction of radiation transport events in the context of the entry heating environment. The equivalent-width and exponential approximations are employed to reduce the computational requirements of the governing equations. Novel features are introduced in the use of an Elsasser band model to estimate line overlapping events and in the formulation of the wall reflection events. A matrix of calculations is presented to allow an assessment of the trade-offs between accuracy and computational efforts. It is concluded that the equivalent width model allows significant savings in computational effort with only modest penalties in accuracy. Consequently, the model should be viewed as an attractive candidate for use in radiation-coupled flow field prediction procedures. Author

N75-21567*# Illinois Univ., Urbana.
NOZZLE FREE JET FLOWS WITHIN THE STRONG CURVED SHOCK REGIME Ph.D. Thesis
Tso-Shin Shih 1975 72 p refs
(Grant NGL-14-005-140)
(NASA-CR-142675) Avail: NTIS HC $4.25 CSCL 20D

A study based on inviscid analysis was conducted to examine the flow field produced from a convergent-divergent nozzle when a strong curved shock occurs. It was found that a certain constraint is imposed on the flow solution of the problem which is the unique feature of the flow within this flow regime, and provides the reason why the inverse method of calculation cannot be employed for these problems. An approximate method was developed to calculate the flow field, and results were obtained for two-dimensional flows. Analysis and calculations were performed for flows with axial symmetry. It is shown that under certain conditions, the vorticity generated at the jet boundary may become infinite and the viscous effect becomes important. Under other conditions, the asymptotic free jet height as well as the corresponding shock geometry were determined. Author

N75-21568*# Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN, FABRICATION, AND TESTING OF A CRYOGENIC THERMAL DIODE Interim Research Report
J. Quadrini and R. Kosson Dec. 1974 94 p refs
(Contract NAS2-7492)
(NASA-CR-137616) Avail: NTIS HC $4.75 CSCL 20M

Cryogenic heat pipe diode applications and a new heat pipe geometry are discussed. This new geometry employs excess liquid to block the vapor space of the evaporator and part of the transport section during reverse mode conditions. An orifice plate is positioned in the pipe at the blocking meniscus location, with the opening arranged to permit proper liquid distribution in both ground tests and zero g operation. Experimental data are presented for a room temperature heat pipe modified to operate as a blocking orifice diode. The test results verify feasibility of the blocking orifice technique with the diode having a rapid shutoff characteristic. The selection of a diode for fabrication and test was based mainly on a parametric investigation of the liquid trap and liquid blockage techniques. The blocking orifice form of liquid blockage was selected for the cryogenic diode based on its high throughput, small reservoir requirement, and small energy and time required for shutoff. Author

N75-21569# Sandia Labs., Albuquerque, N.Mex.
GAS-TRANSFER ANALYSIS SECTION D: UNCHOKED CHARGING SOLUTIONS

D. R. Chenoweth Oct. 1974 21 p refs
(Contract AT(29-1)-789)
(SAND-74-8214) Avail: NTIS HC $3.25

The theoretical analysis of gas-transfer derives the exact subsonic charging solutions (infinite supply volume) in terms of the minimum flow area Crocco number for both adiabatic and isothermal reservoirs. The solutions are valid for an ideal gas and unity loss coefficient but arbitrary time-dependent product of discharge coefficient and minimum flow area. Extensive results are presented for constant flow area where it is shown that all possible charging solutions can be presented in nondimensional form with only a few graphs. It is shown that simple expressions for the time of pressure equilibrium exist in terms of a reference time scale, the ratio of specific heats, and the initial receiver to supply pressure ratio. The choked flow solutions from Section B are coupled to these results and are included for completeness. Author (NSA)

N75-21570# Sandia Labs., Albuquerque, N.Mex.
GAS-TRANSFER ANALYSIS SECTION C: RECEIVER CONDITIONS AND UNCHOKE TIMES
D. R. Chenoweth Oct. 1974 24 p refs
(Contract AT(29-1)-789)
(SAND-74-8213) Avail: NTIS HC $3.25

The theoretical analysis of gas-transfer develops ideal-gas expressions for receiver-gas state variables valid for both of the limiting cases, adiabatic or isothermal reservoirs. These expressions hold regardless of whether the transfer flow is choked or unchoked. However, a complete time-dependent solution is possible only if separate choked and unchoked solutions are derived. The time of unchoking is therefore derived for both adiabatic and isothermal reservoirs with unity and non-unity loss coefficient, lambda. Furthermore, expressions for lambda in the special case of constant-area pipe flow are presented and discussed.
Author (NSA)

N75-21571# Sandia Labs., Albuquerque, N.Mex.
METHOD FOR PREDICTING NATURAL CONVECTION IN CLOSED VESSELS
R. J. Kee and A. A. McKillop Oct. 1974 12 p refs Presented at the CUBE Symp., Livermore, Calif., 23-25 Oct. 1974
(Contract AT(29-1)-789)
(SAND-74-8662; Conf-741001-34) Avail: NTIS HC $3.25

A numerical technique is presented which predicts the transient, two-dimensional, laminar natural convection within closed vessels. The finite difference analogs of the Navier-Stokes and the thermal energy equations are solved in an Eulerian stream function-vorticity framework. The parabolic transport equations (vorticity and thermal energy) are solved by a method, which is called a hybrid, that combines desirable features from both explicit and Alternating Direction Implicit methods. By treating the advection terms explicitly and the diffusion terms as in an ADI scheme, a very efficient solution algorithm can be employed. Conservative windward differencing, which accounts for the direction of the fluid motion, is used for the nonlinear advection terms. The elliptic stream function equation is solved by an iterative ADI method. Author (NSA)

N75-21572# Sandia Labs., Albuquerque, N.Mex.
GAS-TRANSFER ANALYSIS. SECTION E: UNCHOKED DISCHARGE SOLUTIONS
D. R. Chenoweth Oct. 1974 28 p refs
(Contract AT(29-1)-789)
(SAND-74-8215) Avail: NTIS HC $3.75

The exact subsonic discharging solutions (infinite receiver volume) are derived in terms of the minimum flow area, Mach number, for both adiabatic and isothermal reservoirs. The solutions are valid for an ideal gas and unity loss coefficient. The solutions are different mathematically for diatomic and monatomic gases as well as for the initially choked and initially unchoked gases. Extensive results are presented for constant C(d)A(e) where it is shown that all possible discharge solutions can be presented in nondimensional form with only a few graphs. Also it is shown that simple expressions for the time of pressure equilibrium exist in terms of a reference time scale, the ratio of specific heats, and the initial receiver to supply pressure ratio. NSA

N75-21573# Sandia Labs., Albuquerque, N.Mex.
GAS-TRANSFER ANALYSIS, SECTION F: APPROXIMATE UNCHOKED SOLUTIONS FOR ARBITRARY V INFINITY/V SUB 0
D. R. Chenoweth Nov. 1974 43 p refs
(Contract AT(29-1)-789)
(SAND-74-8216) Avail: NTIS HC $3.75

The approximate subsonic gas-transfer solutions, valid for arbitrary receiver to supply volume ratio, in terms of the minimum flow area Crocco number for both adiabatic and isothermal reservoirs are derived. The solutions hold for an ideal gas and unity loss coefficient, but arbitrary time-dependent product of discharge coefficient and minimum flow area, C(d)A(e). Illustrative results are presented for constant C(d)A(e) and various values of the volume ratio (receiver to supply). It is shown that for each value of the volume ratio simple expressions for the time of pressure equilibrium exist in terms of a reference time scale, the ratio of specific heats, and the initial receiver to supply pressure ratio. The choked flow solutions are coupled to these results and are included for completeness. Author (NSA)

N75-21574# Monsanto Research Corp., St. Louis, Mo.
RHEOLOGY OF CONCENTRATED SUSPENSIONS OF SPHERES. 1: EFFECT OF THE LIQUID-SOLID INTERFACE
Sheau VanKao, Lawrence E. Nielsen, and Christopher T. Hill Aug. 1974 26 p refs
(Contract N00014-67-C-0218; ARPA Order 876)
(AD-A001344; HPC-74-166) Avail: NTIS CSCL 20/4

A coaxial cylinder viscometer was used to measure the rheological behavior of concentrated suspensions of glass spheres in a nonpolar liquid, a polar liquid, and a liquid of medium polarity. The glass beads had untreated surfaces, surfaces with absorbed octylamine, or hydrophobic surfaces prepared by treating the surfaces with dimethyldichlorosilane. All the suspensions were Newtonian, except for the suspension of silane treated beads in glycerol which was pseudoplastic. Contact angle and sedimentation measurements indicated that the glycerol-silane treated beads system contained beads in an agglomerated state. The viscosities of the suspensions obey a mooney type equation. In the newtonian systems all the suspensions containing treated glass surfaces had lower relative viscosities than the analogous systems with untreated surfaces. GRA

N75-21575# Monsanto Research Corp., St. Louis, Mo.
RHEOLOGY OF CONCENTRATED SUSPENSIONS OF SPHERES. 2: HIGHLY CONCENTRATED SUSPENSIONS AND PASTES
Sheau VanKao, Lawrence E. Nielson, and Christopher T. Hill 30 Aug. 1974 21 p refs
(Contract N00014-67-C-0218; ARPA Order 876)
(AD-A001345; HPC-74-167) Avail: NTIS CSCL 20/4

A modified Stormer viscometer was used to study the flow behavior of suspensions of glass beads in liquids of different polarity over the volume concentration range from 50 to 60 percent. The flow behavior was pseudoplastic in some cases but rigid pastes were observed in other cases in this concentration range. The nature of the particle surface affected the flow behavior in the same manner as at lower concentrations. At still higher concentrations (= 60 v/o), a yield stress was found for all systems. Slipping occurred in the viscometer, and this phenomenon sets an upper limit for the study of concentrated suspensions. GRA

N75-21576# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
COMPARISON OF TWO NUCLEUS SPECTRUM MEASURING DEVICES AND THE INFLUENCE OF SEVERAL VARIABLES ON CAVITATION THRESHOLD IN WATER
Emin Yilmaz Nov. 1974 228 p refs
(Grant NSF GK-1889)
(PB-238160/6; MICHU-013570-40-T) Avail: NTIS HC $7.50 CSCL 20D

Two nucleus spectrum measuring systems were evaluated by measuring natural nuclei content of tap water. The Coulter counter technique which is used extensively in blood cell counting, and relies upon the electrical conductivity of the liquid, and a

light scattering technique were both found to be adequate for nucleus spectrum measurement for special cases. GRA

N75-21577# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
STABILITY OF A THREE-DIMENSIONAL BOUNDARY LAYER Final Report
Jeffrey B. Morton and Ira D. Jacobson Oct. 1974 18 p refs (Contract DAAD05-72-C-0131; DA Proj. 1T1-61102-A-33D) (AD-A003174; ESS-3318-113-74; BRL-CR-191) Avail: NTIS CSCL 20/4

The stability of a three-dimensional boundary layer on a semi-infinite rotating cylinder at angle of attack in a uniform incompressible flow is studied. The results shed some new light on the behavior of disturbances indicating that inflection-point instability may not dominate. Numerical solution of the Orr-Sommerfeld equation is used to obtain the results and an approximate analytic solution is shown to be in good agreement with the numerical results. GRA

N75-21578# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE DISCHARGE COEFFICIENT OF A SWIRL INJECTOR WITH A SCREW SWIRLER
S. S. Leshchinskii 15 Nov. 1974 18 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (USSR), no. 133, 1971 p 47-56
(AD-A002885; FTD-HT-23-1483-74) Avail: NTIS CSCL 20/4

The introduction of an equivalent hydraulic conduit of a swirl injector when calculating the discharge coefficient of an injector with swirler is found to allow the accounting of the effect of the swirler and injector body geometry on the magnitude of fluid discharge. The calculation carried out for various types of injectors shows that the theoretical values of the discharge coefficients, obtained by using the techniques considered, deviate from the experimental value less than 5%. M.J.S.

N75-21579# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF A COMPOSITE AND SUPERSONIC FLOW IN A CURVILINEAR CONDUIT
V. B. Panfilovich 20 Nov. 1974 15 p Transl. into ENGLISH from Tr. Aviats. Inst. (USSR), no. 133 1971 p 30-36
(AD-A002886; FTD-HC-23-1482-74) Avail: NTIS CSCL 21/5

The problem is discussed of constructing curvilinear conduit in which a continuous increase in velocity occurs when crossing the sonic barrier. Since reliable methods of calculating a combined and supersonic flow (with an initial streamline of arbitrary form when crossing the sound barrier) are lacking, the following are used: equations of motion, continuity equations, streamline equations, the Bernoulli gas equation, and expressions for the flow function. M.J.S.

N75-21580# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE EFFECTS OF STEADY, THREE DIMENSIONAL PERTURBATIONS IN BOUNDARY LAYERS Final Report
Raymond Sedney Nov. 1974 47 p refs
(DA Proj. 1T1-61101-A-91A)
(AD-A003189; BRL-1748) Avail: NTIS CSCL 20/4

The primary purpose of this report is to survey the available information mainly experimental, on the subject. Most attention is given to the complex flow field resulting when a 3-D protuberance is introduced into a laminar boundary layer; less can be said about the turbulent case or 2-D protuberances because enough detailed, careful experiments have not been made. There are some features of the induced flow fields common to all speed ranges; applications range from flow in the atmospheric boundary layer to hypersonic vehicle problems. Some attempts to analyze the downstream flow are also summarized. GRA

N75-21581# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
UNSTEADY HYDRODYNAMICS OF A BODY OF REVOLUTION WITH FAIRWATER AND RUDDER Final Report, Oct. 1971 - Mar. 1974
Douglas P. Glasson Mar. 1974 130 p refs
(Contract N00014-67-A-0204-0058; SR0090101; MIT Proj. DSR-73836)
(AD-A003009; Rept-74-7) Avail: NTIS CSCL 13/10

Potential flow models were developed for a submerged body of revolution with fin and rudder appendages. Forces and moments on the lifting surfaces and hull were predicted at a steady angle of attack, and the procedure was extended to the time-dependent angle of attack case. Experimental, analytical, and numerical approaches are described. Author

N75-21702 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EULER AND LAGRANGE CHARACTERISTICS OF TURBULENT FLOW AND SOLID PARTICLES MOVING NEAR ITS BOTTOM
T. P. Kromskaya and G. S. Fomenko *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 80-86 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 65-69 (For availability see N75-21693 13-42)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-21582* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PSEUDO-NOISE TEST SET FOR COMMUNICATION SYSTEM EVALUATION Patent
Gabriel R. Wallace, William E. Salter (Sperry Rand Corp., Huntsville, Ala.), Glenn D. Weathers (Sperry Rand Corp., Huntsville, Ala.), and Sidney S. Gussow, inventors (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Issued 1 Apr. 1975 6 p Filed 28 Nov. 1973 Supersedes N74-13146 (12- 04, p 0413)
(NASA-Case-MFS-22671-1; US-Patent-3,875,500; US-Patent-Appl-SN-419831; US-Patent-Class-324-57PS; US-Patent-Class-178-69A; US-Patent-Class-235-181; US-Patent-Class-324-77H; US-Patent-Class-325-67) Avail: US Patent Office CSCL 14B

A test set for communications systems is described which includes a pseudo noise sequence generator providing a test signal that is fed to a pair of signal channels. The first channel includes a spectrum shaping filter and a conditioning amplifier. The second channel includes a variable delay circuit, a spectrum shaping filter matched to the first filter, and an amplifier. The output of the first channel was applied to the system under test. The output of the system and the output of the second channel are compared to determine the degree of distortion suffered by the test signal due to the communications system. Official Gazette of the U.S. Patent Office

N75-21583 Tennessee Technological Univ., Cookeville.
DESIGN OF A TORQUE CURRENT GENERATOR FOR STRAPDOWN GYROSCOPES Ph.D. Thesis
Rayburn Doyle McKnight 1974 228 p
Avail: Univ. Microfilms Order No. 75-3623

The design, analysis, and evaluation is discussed of an optimum performance torque current generator for use with strapdown gyroscopes. The criteria used to evaluate the design were: steady-state accuracy; margins of stability against self-oscillation, temperature variations, aging, etc.; static and drift errors; PVR errors; transient errors; classical frequency and time domain characteristics; and the equivalent noise at the input of the comparator operational amplifier. Dissert. Abstr.

N75-21584 Pennsylvania Univ., Philadelphia.
MICROWAVE HOLOGRAPHY EMPLOYING CIRCULARLY SCANNED SYNTHETIC APERTURE Ph.D. Thesis
Mohammad Ali Kujoory 1974 161 p
Avail: Univ. Microfilms Order No. 75-2750

A theory of coherent scalar imaging for the scanned transmitter-receiver (T-R) mode of holography was formulated

and a mechanical double circular scanner which offers quasi-real-time microwave recording was designed, developed, and evaluated. Rapid recording of scanned T-R holograms is permitted over a circular synthetic aperture of one meter diameter in a time period as short as a minute. The raw hologram data collected, is processed to fit the limited dynamic range of the CRT-film system usually employed in electro-optic image retrieval schemes with minimal sacrifice in information. Several electronic processing schemes were studied and their effect on image quality determined leading to the identification of bidirectional logarithmic compression and signal clipping as optimal. A simple technique for holographic subtraction used to extract the image of the desired object from undesired background information was devised. Finally, the double circularly scanned T-R system is used in a simulation experiment of imaging buried objects employing bidirectional logarithmic compression and electronic holographic subtraction techniques. Dissert. Abstr.

N75-21585 Arizona Univ., Tucson.
GENERATION AND MEASUREMENT OF SMALL ABERRATIONS Ph.D. Thesis
Lewis Jack Golden 1974 137 p
Avail: Univ. Microfilms Order No. 75-4109

The construction of two candidate test instruments and their evaluation in terms of small wave front aberration measurements are described. A laboratory wave front error simulator was designed and fabricated to evaluate the various test instruments. This simulator can introduce low-order aberrations up to several waves in magnitude, with an incremental adjustment capability of wavelength/100. Each aberration type can be introduced independently and with any orientation desired. The simulator was used to evaluate two tests: a dynamic Hartmann test and an interferometric Zernike test. The dynamic Hartmann test configuration is discussed and analyzed, and the construction of an experimental test instrument is described. The wave front error simulator was used to determine experimentally the capability of the Hartmann test instrument in detecting low-order aberrations of different types under laboratory conditions. Dissert. Abstr.

N75-21586 Michigan State Univ., East Lansing.
SURFACE-WAVE TRANSDUCER MODELING Ph.D. Thesis
Albert Ochs Simeon 1974 179 p refs
Avail: Univ. Microfilms Order No. 75-7252

Equivalent circuit models are developed for surface-wave transducers and their relation to the crossed-field model is shown. The surface wave problem is simplified to obtain a closed form solution, by considering only particle displacements in the sagittal plane. Dynamic variables and the characteristic impedance for piezoelectric transmission lines are defined. The response of an alternate phase array is extended to frequencies other than the synchronous frequency, by considering only the short-circuit current response at first which permits the conformal mapping of the semi-infinite strip and the residual solution of the potential. The admittance matrix of a basic section is obtained along with the corresponding equivalent circuit and a parallel circuit. By duality the transmission line part of this circuit is changed and the crossed-field circuit model is obtained. Over any frequency range of practical interest the performance of the equivalent circuit resembles the crossed-field model so that the established analysis and design procedures apply. Dissert. Abstr.

N75-21587*# Research Triangle Inst., Research Triangle Park, N.C.
STUDY TO DEFINE LOW VOLTAGE AND LOW TEMPERATURE OPERATING LIMITS OF THE PIONEER 10/11 METEOROID DETECTION EQUIPMENT (MDE) SYSTEM Final Report
C. D. Parker Feb. 1975 24 p refs
(Contract NAS1-13137)
(NASA-CR-132635) Avail: NTIS HC $3.25 CSCL 14B

The Pioneer 10/11 meteoroid detection equipment (MDE) pressure cells were tested at liquid nitrogen (LN2) and liquid helium (LHe) temperatures with the excitation voltage controlled as a parameter. The cells failed by firing because of pressurizing gas condensation as the temperature was lowered from LN2 to LHe temperature and when raised from LHe temperature. A study was conducted to determine cell pressure as a function of temperature, and cell failure was estimated as a function of temperature and excitation voltage. The electronic system was also studied, and a profile of primary spacecraft voltage (nominally 28 Vdc) and temperature corresponding to electronic system failure was determined experimentally. Author

N75-21588*# Ionics Research, Inc., Houston, Tex.
FLIGHT CONTAMINANT TRACE ANALYSER. PHASE 1: CHROMATOGRAPHIC INPUT SYSTEM Final Report
Apr. 1975 73 p
(Contract NAS9-14001)
(NASA-CR-141733) Avail: NTIS HC $4.25 CSCL 14B

The development of a chromatographic column capable of resolving compounds associated with spacecraft atmospheres is presented. Consideration is given to sampling techniques, column parameters and operation, and column interface with a mass spectrometer. A capillary column coated with a mixture of polyalkylene glycols is found to provide the best selectivity for resolving multicomponent mixtures found in spacecraft atmospheres. Temperature programming and isothermal operation of the column are evaluated and it is found that temperature programming has a shorter analysis time for a given carrier gas flow rate and overall superior resolution. It is observed that hydrogen provides a 15% savings in analysis time over helium. Following the optimization of column operational parameters, a mixed phase Ucon capillary is prepared for evaluation during the column test period in which the test sample is automatically analyzed. Analysis of the multicomponent test mixture is completed within 45 minutes provided temperature programming is used. All but two of the test compounds are well resolved. Author

N75-21589*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM: EARTH RESOURCES EXPERIMENT PACKAGE. SENSOR PERFORMANCE EVALUATION. VOLUME 6: (S194) L-BAND RADIOMETER Final Report
Gerald P. Kenney 7 Apr. 1975 57 p refs
(Contract NAS8-24000)
(NASA-CR-141752; MSC-05546-Vol-6) Avail: NTIS HC $4.25 CSCL 17G

Analysis of the Skylab S194 L-band radiometer experiment data provided significant results pertaining to the actual realized performance during flight. Analysis of preflight test data provided a baseline from which to compare the experiment flight performance, although many radiometric data performance capabilities could only be demonstrated in the flight environment. The final results establish the overall hardware performance of the S194 system from which prospective users of the flight data can refer for various scientific applications. Instrument performance is presented in the areas of housekeeping and internal calibration parameters, antenna system integrity, dynamic range, linearity, precision, resolution, and absolute accuracy. Supplementary evaluations were included for an error analysis of system calibration stability. Results of the evaluation show that the instrument performance was generally as expected. Conclusions are drawn from the final evaluation results, and recommendations for improving the effectiveness of a future program are offered. Author

N75-21590*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
A PRACTICAL MULTI-SPECTRUM HADAMARD TRANSFORM SPECTROMETER
Ming Hing Tai, D. A. Briotta, Jr., N. Kamath, and Martin Harwit [1975] 17 p refs
(Grant NGR-33-010-210; Contract F19628-74-C-0110)
(NASA-CR-142649) Avail: NTIS HC $3.25 CSCL 20F

A Hadamard Transform Spectrometer (HTS) which simultaneously obtains fifteen infrared spectra, each having 255 spectral elements was constructed. Spectra are obtained essentially in real time through use of a minicomputer with 8K words of memory and a CRT display. This permits operation of the instrument in the field. Author

N75-21591# Joint Publications Research Service, Arlington, Va.
EQUIPMENT FOR MEASURING VIBRATION PARAMETERS
A. N. Burago, ed. 11 Apr. 1975 50 p refs Transl. into

ENGLISH from the book "Apparatura dlya izmereniya parametrov vibratsii" Leningrad, Znaniye Society of the RSFSR, 1967 p 3-47
(JPRS-64534) Avail: NTIS HC $3.75

Charts of equipment specifications for various vibration measuring apparatus. This equipment includes vibration meters, piezoelectric gages, accelerometers, oscillographs, pen recorders, and galvanometers. For individual titles, see N75-21592 through N75-21595.

N75-21592 Joint Publications Research Service, Arlington, Va.
VIBRATION RESEARCH EQUIPMENT (A SURVEY)
R. V. Vasilyeva *In its* Equipment for Meas. Vibration Parameters (JPRS-64534) 11 Apr. 1975 p 3-26 Transl. into ENGLISH from the book "Apparatura dlya izmereniya parametrov vibratsii" Leningrad, Znaniye Society of the RSFSR, 1967 p 5-28 (For availability see N75-21591 13-35)

A chart is presented on Soviet vibration measuring equipment, including type of instrument, manufacturer, frequency range, displacement, velocity, acceleration, and measured variable. Apparatus with piezoelectric sensors is also examined, along with equipment with inductive, eddy current, and capacitive pickups. J.A.M.

N75-21593 Joint Publications Research Service, Arlington, Va.
SURVEY OF THE EXISTING STRUCTURAL DESIGNS OF PIEZOELECTRIC ACCELEROMETERS
K. R. Tsekhanskiy *In its* Equipment for Meas. Vibration Parameters (JPRS-64534) 11 Apr. 1975 p 27-37 refs Transl. into ENGLISH from the book "Apparatura dlya izmereniya parametrov vibratsii" Leningrad, Znaniye Society of the RSFSR, 1967 p 29-38 (For availability see N75-21591 13-35)

A chart on Soviet piezoelectric accelerometers is shown, including the type of pickup, manufacturer, sensitivity, frequency range, frequency of natural vibrations, and capacitance. Other accelerometer properties, such as temperature range, rate, dimensions, transverse sensitivity, and greatest acceleration point, are also considered. J.A.M.

N75-21594 Joint Publications Research Service, Arlington, Va.
SOVIET LIGHT-BEAM OSCILLOGRAPHS AND HIGH-SENSITIVITY PEN-RECORDING INSTRUMENTS
Yu. K. Bovin and G. Ya. Runyantsev *In its* Equipment for Meas. Vibration Parameters (JPRS-64534) 11 Apr. 1975 p 38-42 Transl. into ENGLISH from the book "Apparatura dlya izmereniya parametrov vibratsii" Leningrad, Znaniye Society of the RSFSR, 1967 p 39-43 (For availability see N75-21591 13-35)

A chart is presented on Soviet light beam oscillographs, including such parameters as type of oscillograph, type of recording, no. of channels, photographic tape (width, length, and velocity), and time mark interval. Further descriptions of the instruments are included, considering power supply, dimensions, weight, and galvanometers used. Technical specifications for high sensitivity pen recorders are also cited. J.A.M.

N75-21595 Joint Publications Research Service, Arlington, Va.
SOVIET OSCILLOGRAPHIC GALVANOMETERS
A. N. Zaslavskiy *In its* Equipment for Meas. Vibration Parameters (JPRS-64534) 11 Apr. 1975 p 43-46 Transl. into ENGLISH from the book "Apparatura dyla izmereniya parametrov vibratsii" Leningrad, Znaniye Society of the RSFSR, 1967 p 44-47 (For availability see N75-21591 13-35)

A chart of equipment specifications for various Soviet oscillographic galvanometers is presented, including the type of galvanometer, natural frequency, operating frequency and range, current constant, sensitivity to the current, nonlinearity of frequency (amplitude characteristics), internal and external resistance, damping procedure, and maximum current. These characteristics are described for single series, frame, and loop galvanometers. J.A.M.

N75-21596# Pisa Univ. (Italy).
ACCELERATION GRAPH WITH DIGITAL MAGNETIC REGISTRATION OF THREE CHANNELS [ACCELEROGRAFO CON REGISTRAZIONE MAGNETICA DIGITALE A TRE CANALI]
P. Maestrini and G. Rossi 1973 112 p refs In ITALIAN
(RL-148(73)) Avail: NTIS HC $5.25

An accelerometer is described with a digital magnetic tape cassette recorder. It records triaxial acceleration signals, and the time of signal initiation. Transl. by F.O.S.

N75-21597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPOSITION ANALYZER FOR MICROPARTICLES USING A SPARK ION SOURCE
Siegfried Auer and Otto E. Berg Mar. 1975 25 p refs Submitted for publication
(NASA-TM-X-70874; X-670-75-87) Avail: NTIS HC $3.25 CSCL 14B

Iron microparticles were fired onto a capacitor-type microparticle detector which responded to an impact with a spark discharge. Ion currents were extracted from the spark and analyzed in a time-of-flight mass spectrometer. The mass spectra showed the element of both detector and particle materials. The total extracted ion currents was typically 10A within a period of 100ns, indicating very efficient vaporization of the particle and ionization of the vapor. Potential applications include research on cosmic dust, atmospheric aerosols and cloud droplets, particles ejected by rocket or jet engines, by machining processes, or by nuclear bomb explosions. Author

N75-21598*# Technicolor Graphic Services, Inc., Houston, Tex.
EVALUATION OF FILM TYPE QX 807 (SO-368, KODAK EKTACHROME MS, ESTAR THIN BASE, WITH AN EQUIVALENT WRATTEN 2A FILTER OVERCOAT)
Harold E. Lockwood Apr. 1975 31 p refs
(Contract NAS9-11500)
(NASA-CR-141734) Avail: NTIS HC $3.75 CSCL 14E

A color film with a sensitivity and color balance equal to SO-368, Kodak MS Ektachrome (Estar thin base) was required for use on the Apollo-Soyuz test project (ASTP). A Wratten 2A filter was required for use with the film to reduce short wavelength effects which frequently produce a blue color balance in aerial photographs. The background regarding a special emulsion which was produced with a 2A filter equivalent as an integral part of an SO-368 film manufactured by Eastman Kodak, the cost for production of the special film, and the results of a series of tests made within PTD to certify the film for ASTP use are documented. The tests conducted and documented were physical inspection, process compatibility, effective sensitivity, color balance, cross section analysis, resolution, spectral sensitivity, consistency of results, and picture sample analysis. Author

N75-21599*# Honeywell, Inc., Lexington, Mass. Radiation Center.
LIMB RADIANCE INVERSION RADIOMETER Final Report
R. W. Drozewski, J. C. Gille, J. R. Thomas, K. J. Twohig, and R. R. Boyle Jan. 1975 218 p
(Contract NAS5-21652)
(NASA-CR-143712) Avail: NTIS HC $7.25 CSCL 14B

Engineering and scientific objectives of the LRIR experiment are described along with system requirements, subassemblies, and experiment operation. The mechanical, electrical, and thermal interfaces between the LRIR experiment and the Nimbus F spacecraft are defined. The protoflight model qualification and acceptance test program is summarized. Test data is presented in tables to give an overall view of each test parameter and possible trends of the performance of the LRIR experiment. Conclusions and recommendations are included. Author

N75-21600*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR PROVIDING A SERVO-DRIVE SIGNAL IN A HIGH SPEED STEPPING INTERFEROMETER Patent Application
Rudolf A. Schindler, inventor (to NASA) (JPL) Filed 4 Apr. 1975 30 p
(Contract NAS7-100)
(NASA-Case-NPO-13569-1; US-Patent-Appl-SN-565162) Avail: NTIS HC $3.75 CSCL 14B

In infrared spectroscopy utilizing an interferometer, position stepping of the optical path difference in the interferometer must be accomplished quite rapidly. This is accomplished by applying a drive signal to the moveable mirror in the interferometer. As the mirror moves in response to this drive signal, effectively

getting closer to the new null point, the drive signal is gradually reduced, in response to detected reference laser fringes. At the new null position, the drive signal will effectively be zero. A binary up/down counter drives a digital/analog converter (DAC). The output from the DAC is supplied to the mirror moving means. The fringes generated by a reference laser are detected as the mirror moves, causing the up/down counter to be decremented to its null count, thereby reducing the output of the DAC.
NASA

N75-21601*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SAMPLER OF GAS BORNE PARTICLES Patent Application
Charles G. Miller (JPL) and James B. Stephens, inventors (to NASA) (JPL) Filed 28 Mar. 1975 17 p
(Contract NAS7-100)
(NASA-Case-NPO-13396-1; US-Patent-Appl-SN-563283) Avail: NTIS HC $3.25 CSCL 14B

An atmosphere sampler includes a very thin filter element with straight-through holes on the order of 1 micron. A sample of air with particles to be examined is driven by means of a pressurized low molecular weight gas, e.g., He to the filter element front side. A partial vacuum may be present at the back side of the filter element. The pressure differential across the filter element is just below the rupture point of the filter element. By admixing a low molecular weight gas as the carrier gas with the air sampler, the velocity is maximized for the particular pressure differential across the filter element. NASA

N75-21602# Defence Research Establishment Valcartier (Quebec).
APPROXIMATION OF OFF-SHELL SCATTERING OPERATORS FOR NON-LORENTZIAN LINE SHAPE CALCULATIONS
P. L Roney Sep. 1974 34 p refs
(DREV Proj. 97-82-06)
(DREV-711/74) Avail: NTIS HC $3.75

A previously derived approximation for the matrix elements of the Fano relaxation operator, which gives rise to non-Lorentzian line wings, is examined. This approximation is expressed in terms of an off-the-energy shell scattering operator. Calculation of this operator by a second order Born expansion is unsuitable because this procedure limits the radiation frequency dependence to the same order. The main part of this paper is devoted to expressing the off-shell scattering operator in the time-ordered formalism. In this form a scattering operator approximation can be applied which is not restrictive to the frequency dependence. Author

N75-21603# Royal Greenwich Observatory, Herstmonceux (England).
GREENWICH TIME REPORT ROYAL GREENWICH OBSERVATORY TIME AND LATITUDE SERVICE, JANUARY - JUNE 1974
Jun. 1974 37 p
Avail: NTIS HC $3.75

Results from the Greenwich Time and Latitude Service for the period 1974 January to June inclusive are reported in tabular form. Author

N75-21604# California Univ., Livermore. Lawrence Livermore Lab.
ULTRA-FAST STREAK CAMERA FOR OPTICAL PULSE MEASUREMENTS
J. W. Houghton, S. W. Thomas, and L. W. Coleman 7 Oct. 1974 9 p refs Presented at the Intern. Instrumentation Automation Conf., New York, 28-31 Oct. 1974 Sponsored by ERDA
(UCRL-76092; Conf-741054-1) Avail: NTIS HC $3.25

The requirements and techniques for time resolved subnanosecond diagnostics of laser pulses are reviewed. The advantages and limitations of applying image converter streak cameras to the problem of optical pulse diagnostics are discussed. The design and operation of a unique 10-ps resolution streak camera, and examples of its application to optical pulse measurement are presented. Also included are comments on the development of streak cameras with extended capabilities. Author (NSA)

N75-21605# Aerojet Nuclear Co., Idaho Falls, Idaho.
DEVELOPMENT OF INSTRUMENTS FOR TWO-PHASE FLOW MEASUREMENTS
Oct. 1974 83 p refs
(Contract AT(10-1)-1375)
(ANCR-1181) Avail: NTIS HC $4.75

A state-of-the-art summary on instruments developed or being developed for measuring two phase flow in the Loss-of-Fluid Test (LOFT) and semiscale tests is presented. Brief descriptions of the purpose, measurement principles, design and development bases, designs, and performance are given for instruments to measure fluid velocity, momentum flux, density, and level. Author (NSA)

N75-21606# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
CONNECTION OF A QUADRUPOLE MASS SPECTROMETER TO A REAL TIME DIGITAL COMPUTER: APPLICATION TO CHEMICAL PROCESSES Ph.D. Thesis - Toulouse Univ. [COUPLAGE D'UN SPECTROMETRE DE MASS QUADRIPOLAIRE A UN CALCULATEUR NUMERIQUE EN TEMPS REEL: APPLICATION A L'ETUDE DES PROCESSUS CHIMIQUES]
Dominique Pinglot 1974 150 p refs In FRENCH
(Contract DGRST-70-02-150)
(LAAS-Publ-1128) Avail: NTIS HC $5.75

The convection of a quadrupole mass spectrometer to a digital real time computer for identification of a vinyl acetate or absorption pilot unit is presented. The spectrometer is detailed together with the modifications required to use it as a detector for the specific process considered. The interfacing electronic units are discussed with regard to data acquisition and real time computer programs. The overall performance was evaluated. The transfer function for the system comprising the introduction line and spectrometer was determined and the limitations of the system are outlined. ESRO

N75-21607# Army Foreign Science and Technology Center, Charlottesville, Va.
RADIATION AND CHEMICAL DETECTORS
A. P. Goritskii 27 Sep. 1974 92 p refs Transl. into ENGLISH of the book "Pribory Radiats. i Khim. Razvedki" Moscow, Dosaff, 1969 112 p
(AD-A002724; FSTC-HT-23-2256-72) Avail: NTIS CSCL 18/4

General information is presented on radioactive radiation, the damaging effects of radioactive rays, and dosimeters. Technical data, design, and operational principles of dosimeters are given along with the technical characteristics of the instruments which may be useful in civil defense. Chemical devices are described which are used to detect dangerous substances in the air or in a locality. M.J.S.

N75-21608# Applied Technology, Sunnyvale, Calif.
VERTICAL BARGRAPH DISPLAY Final Report
Glen F. Ingle Sep. 1974 40 p
(Contract DAAB07-73-C-0256)
(AD-A002695; ECOM-73-0256-F) Avail: NTIS CSCL 09/5

The program was divided into three separate technical efforts, (1) the mechanical packaging, (2) the electronic circuitry and (3) the liquid crystal plates. The packaging and circuitry efforts proceeded quite smoothly. There were some modifications in both areas due to the desire for interchangeability of L.C. panels for evaluation purposes and variations in lighting schemes but the basic packaging and circuitry concepts proved satisfactory. The liquid crystal plates proved a difficult matter. Because of the subjective evaluation required of the L.C. panel, it was impossible to ascertain the best L.C. cosmetic arrangement. Rather, a series of various combinations of L.C. materials, backplates and lighting systems were assembled and tried. Parallax-face scales combined with effective glass seals also required extensive experimentation. GRA

N75-21609# TRW, Inc., Philadelphia, Pa.
PRODUCTION ENGINEERING MEASURES FOR THIN FILM RATIOMETER Quarterly Progress Report, 1 Jul. - 30 Sep. 1974

Harry B. Casey 31 Oct. 1974 44 p refs
(Contract DAAB05-73-C-2077)
(AD-A002593; QPR-5) Avail: NTIS CSCL 14/2

Progress is reported in the development of an optimized production process for the manufacture of thin film ratiometers. Production linearity testing methods are analyzed and a prototype production linearity tester is developed. GRA

N75-21610# Naval Ordnance Lab., White Oak, Md.
COMPARATIVE MEASUREMENTS OF TOTAL TEMPERATURE IN A SUPERSONIC TURBULENT BOUNDARY LAYER USING A CONICAL EQUILIBRIUM AND COMBINED TEMPERATURE-PRESSURE PROBE
Robert L. P. Voisinet, Roland E. Lee, and Hans-Ulrich Meir Jul. 1974 68 p refs
(AD-A002982; NOLTR-74-10) Avail: NTIS CSCL 14/2

The predominant probes used for measuring total temperature in a compressible boundary-layer flow are described. The results of a direct comparison between two of these probes, the conical equilibrium temperature probe (Danberg probe) and the combined temperature-pressure probe of the DFVLR-AVA, are presented. The comparison was made by testing the probes simultaneously in the nozzle-wall turbulent boundary-layer flow of the NOL Boundary Layer Channel at zero and moderate heat-transfer conditions. GRA

N75-21611# Harris Corp., Melbourne, Fla. Electronic Systems Div.
REAL TIME HOLOGRAPHIC RECORDING MATERIALS Final Report, 1 Oct. 1973 - 30 Jun. 1974
R. G. Zech, Lynda M. Ralston, and M. W. Shareck Nov. 1974 289 p refs
(Contract F30602-74-C-0030)
(AD-A002849; RADC-TR-74-287) Avail: NTIS CSCL 20/6

A number of high-quality, dry-working recording materials were evaluated to determine their suitability for holographic data storage and optical data processing applications. Sensitometric, holographic, and systems data were generated. With the RADC-sponsored HRMR system a frame of reference, several film/systems studies were completed that have an important practical impact. In particular, the feasibility of making high-quality fiche replications using straightforward contact copying techniques was demonstrated. The overall conclusion of the study was that some dry-working recording materials could become systems qualified in the near-term. GRA

N75-21612# Army Foreign Science and Technology Center, Charlottesville, Va.
MODULATION TRANSFER FUNCTIONS OF THE PHOTOGRAPHIC MATERIAL DEVELOPER SYSTEM, DETERMINED WITH A BAR TEST-OBJECT
Yu. N. Gorokhovski and A. L. Kuznetsova 17 Mar. 1974 16 p refs Transl. into ENGLISH from Zh. Nauch. Prikl. Fotogr. Kinematogr. (USSR), v. 15, no. 3, 1970 p 196-203
(AD-A002762; FSTC-HT-23-1313-73) Avail: NTIS CSCL 14/5

A study has been made of the modulation-transfer functions (MTF) of two photographic materials of different types with the use of a specially shaped bar test-object. Only when a developer with a high buffer capacity is employed is the MTF invariant with respect to the standard optical density level used in the numerical processing of the curves, and to the method of calculating the MTF. In this case the function concerned is the true MTF of the emulsion layer itself, determined only by the scatter and absorption of light in it. GRA

N75-21613# Tri-Con Associates, Inc., Cambridge, Mass.
THE DESIGN, DEVELOPMENT AND TEST OF ROCKET MASS SPECTROMETER ASSEMBLIES Final Report, Apr. 1971 - May 1974
George P. Murphy May 1974 46 p
(Contract F19628-71-C-0196; AF Proj. 6687)
(AD-A003389; C-118; AFCRL-TR-74-0269) Avail: NTIS CSCL 14/2

The following report reviews the work done in the design and fabrication of rocket borne quadrupole mass spectrometer electronic assemblies and ground support equipment. The electronic assemblies are integrated with a rod housing assembly, which is furnished by the government to make a complete spectrometer unit. The electronic units are designed to supply the necessary data handling circuits, the DC and RF sweep voltages, DC bias voltages, and a programmer which controls the sweep amplitude, time and shape. The mass spectrometers are used to measure positive and negative ion and neutral constituents in the upper atmosphere. GRA

N75-21614# Beckman Instruments, Inc., Anaheim, Calif.
DEVELOPMENT OF AN ACETYLENE MONITOR AT THE PART PER BILLION LEVEL Environment Protection Technology Series
W. Dencker, M. Robinson, and R. Villalobos Jul. 1974 32 p refs
(Contract EPA-68-02-0778)
(PB-238474/1; EPA-650/2-74-056) Avail: NTIS HC $3.75 CSCL 14B

Instrumentation was developed for the collection and analysis of atmospheric acetylene at the part per billion level. The approach used was an automated concentration technique whereby one liter of air was collected in a 1-1/2 x 1/8 inch tube filled with molecular sieve. The trapped contents were then automatically flushed into a gas chromatograph for separation and assay of acetylene. This system was designed to automatically perform three acetylene analysis per hour at acetylene concentrations ranging from .03 to 250 PPB. A portable collection device was developed for the collection of acetylene in locations far removed from the analyzer. The collection devices used in the portable sampler were identical to the collection device on the gas chromatograph. GRA

N75-22064 Illinois Univ., Urbana. Electromagnetics Lab.
REMOTE PROBING TECHNIQUES FOR INHOMOGENEOUS MEDIA
R. Mittra and D. H. Schaubert *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)
(Grant DA-ARO(D)-31-124-71-G77)

N75-22066 Manitoba Univ., Winnipeg. Dept. of Electrical Engineering.
RADIOMETRIC SIGNATURES OF COMPLEX BODIES
M. A. K. Hamid *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 27 p refs (For availability see N75-22045 13-70)

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-21615 Colorado Univ., Boulder.
ATOMIC ABSORPTION OF ULTRA-INTENSE LASER RADIATION Ph.D. Thesis
Michael Reed Teague 1974 151 p
Avail: Univ. Microfilms Order No. 75-3841

The behavior of an atom subjected to an intense pulse of laser radiation was studied theoretically. A strong field perturbation method for solving the Schrodinger equation was developed. Bound-bound, bound-free, and free-free transitions are considered. Conditions under which single-particle and many-particle constant transition probability rates exist are delineated. The statement of energy conservation assumes a new form in strong-field electrodynamics. In general any applied laser frequency can induce transitions between two given atomic energy levels in contrast with the case of weak em fields where a resonant energy condition must be fulfilled. Bound-bound and bound-free transitions in the presence of ultra-strong em fields may not be characterized as N-photon transitions. The problem of the optimal laser power flux for maximum electron energy absorption was studied. Dissert. Abstr.

N75-21616# Avco-Everett Research Lab., Everett, Mass.
LASER BEAM PROPAGATION IN A LONG SOLENOID
S. A. Mani, J. E. Eninger, and J. Wallace Jan. 1975 21 p refs

(RR-407) Avail: NTIS HC $3.25

An analysis of the propagation of a laser beam in a cylindrical magnetically confined plasma with parabolic density profile is presented. The normal modes which are self-trapped are given. It is found that the largest mode that can be trapped by the plasma is given by 1/2((R sub o)2/w squared-1) where R sub o is the radius of the plasma column and w is the fundamental mode width. It is found that all the trapped modes in a finite plasma can easily propagate distances of the order of one kilometer. An exact solution for the amplitude of the electric field for an incident gaussian beam was obtained. The solution exhibits alternate focusing and defocusing of the beam, and the effect of this on the plasma heating is discussed. Author

N75-21617# Lockheed Missiles and Space Co., Palo Alto, Calif.
HETERODYNE METHODS OF LASER INTERFEROMETRY BASED ON ACOUSTIC LIGHT MODULATION
V. I. Teleshevskii [1975] 7 p refs Transl. into ENGLISH from Izmer. Tekh. (USSR), no. 1, 1975 p 42-45
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Heterodyne laser interferometry methods in which the optical frequency conversion is accomplished by means of external light modulation were examined. The properties of light diffraction by ultrasonic waves propagated in an optically transparent medium underlie the acoustic-optical frequency conversion. An ultrasonic light modulator was used to perform the function of grating. M.J.S.

N75-21618# Sandia Labs., Albuquerque, N.Mex.
LASERS AND LED'S FOR OPTICAL FIBER TRANSMISSION
J. K. Galt 1974 5 p refs Presented at Topical Meeting on Optical Fiber Transmission, Williamsburg, Va., 7 Jan. 1975 Sponsored by ERDA
(SAND-74-5520; Conf-750102-1) Avail: NTIS HC $3.25

The requirements for sources to be used in optical fiber transmissions systems are outlined. Laser and LED sources are then discussed in relation to those requirements. Author (NSA)

N75-21619# California Univ., Livermore. Lawrence Livermore Lab.
MODEL LC-13 LASER CALORIMETERS USING COMMERCIAL THERMOELECTRIC MODULES
S. R. Gunn 22 Oct. 1974 10 p
(Contract W-7405-eng-48)
(UCID-16608) Avail: NTIS HC $3.25

Twin disk laser calorimeters using semiconductor thermoelectric modules are described. Comparisons with a previous type indicate agreement within 1%. The new type is simpler and more economical to construct. Author (NSA)

N75-21620# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATIONS OF NON-UNIFORM POCKELS CELLS TO HIGH POWER LASER AMPLIFIERS
W. W. Simmons, B. C. Johnson, and A. J. Glass 18 Oct. 1974 10 p refs Presented at Intern. Meeting on Electron Devices, Washington, D. C., 9-11 Dec. 1974 Sponsored by ERDA
(UCRL-75917; Conf-741211-1) Avail: NTIS HC $3.25

Fast KDP Pockels cells may be designed such that the electric field distribution within the crystal is non-uniform. In this case, amplitude transmission of the cell becomes a function of transverse spatial coordinates. Design parameters, predicted performance curves, and certain experimental results for circular aperture KDP cells, based on specialized, detailed control of V(x,y,t) are presented. These cells are intended to serve the following functions: (1) beam profiling (apodization); (2) temporal pulse shaping; and (3) whole beam self focusing compensation. Each of these functions has direct application to the performance of large, high power Nd: glass laser amplifiers, which are currently under intensive development for laser fusion. Author (NSA)

N75-21621# Colorado Univ., Boulder. Dept. of Physics and Astrophysics.
CRITICAL SCATTERING OF LASER LIGHT BY THIN FLUID FILMS Progress Report, 1 Feb. 1974 - 31 Jan. 1975
R. Mockler and W. OSullivan 31 Jan. 1975 13 p refs
(Contract AT(11-1)-2203)
(COO-2203-3) Avail: NTIS HC $3.25

The close-spaced Fabry-Perot interferometer was used to study the anomalous index of refraction of a critical binary mixture, and a theory was developed that enables the critical indices to be extracted from the experimental results. Efforts to suspend Brownian particles in a single component critical fluid (methyl fluoride) were proved successful, and initial light scattering studies of particle diffusion in a compressible critical fluid are planned. Author (NSA)

N75-21622# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
HEALTH EFFECTS FROM LASERS: NEEDS FOR ADDITIONAL INVESTIGATION
Sol M. Michaelson 1974 12 p refs Presented at the Working Group on Health Effects from Lasers, Dublin, 20 Oct. 1974 Sponsored by ERDA
(UR-3490-601; Conf-741069-1) Avail: NTIS HC $3.25

A critical review is presented of studies into the biological effects on man from exposure to laser energy. Author (NSA)

N75-21623# National Bureau of Standards, Boulder, Colo.
LASER INDUCED DAMAGE IN OPTICAL MATERIALS, 1974: PROCEEDINGS OF A SYMPOSIUM Annual Report
Alexander J. Glass and Arthur H. Guenther Dec. 1974 258 p refs Symp. held at NBS, Boulder, Colo., 22-23 May 1974; sponsored by ONR, the Am. Soc. for Testing and Mater., and the NBS Prepared in cooperation with Air Force Weapons Lab., Kirkland AFB, N. Mex. and California Univ., Livermore, Lawrence Livermore Lab.
(COM-75-50003/3; NBS-SP-414; LC-74-26935) Avail: NTIS MF $2.25; SOD HC as C13.10:414 CSCL 20E

Papers are presented on topics relating to laser induced damage in crystalline and nonlinear optical materials, at dielectric surfaces, and in thin film coatings as well as discussions of damage problems in the infrared region due both to CW and pulsed irradiation. Several reports on the theoretical analysis of laser-materials interaction relative to the damage process were given, along with tabulations of fundamental materials properties of importance in evaluation of optical material response to high power laser radiation. Attention was given to high power laser system design considerations which relate to improved system performance and reliability when various damage mechanisms are operable in such systems. Machining procedures, surface characterization of machined elements, coating of machined components, and the polishing and damage resistance of polished, coated, and bare metal reflectors are discussed. GRA

N75-21624# Massachusetts Inst. of Tech., Cambridge.
ATMOSPHERIC PRESSURE GAS LASERS: MODE LOCKING OF HIGH PRESSURE CO2 LASERS Semiannual Technical Report, 1 Jun. - 30 Nov. 1974
Hermann A. Haus Dec. 1974 25 p refs
(Contract DAHC04-72-C-0044; ARPA Order 0675)
(AD-A002747) Avail: NTIS CSCL 20/5

Mode-locked oscillation is a major bottleneck in the generation of short, high-power laser pulses, for application in laser fusion, communications, or radar. The objective has been to attain a comprehensive understanding of the mode locking of lasers with specific application to high-pressure CO2 TEA lasers. Toward this end work has proceeded along both theoretical and experimental lines. A new theoretical approach was developed, applicable to both active and passive mode locking. Experiments on high-pressure CO2 lasers are in progress to substantiate the theoretical predictions. Results are summarized. GRA

N75-21625# Stanford Univ., Calif. Microwave Lab.
RESEARCH STUDIES ON TUNABLE OPTICAL PARAMETRIC OSCILLATORS Final Report, 1 Oct. 1972 - 30 Sep. 1974
S. E. Harris Oct. 1974 14 p
(Contract F19628-73-C-0025; AF Proj. 6100)
(AD-A003409; SU-ML-2351; AFCRL-TR-74-0552) Avail: NTIS CSCL 20/6

This report contains abstracts on research studies concerning tunable optical sources and with realizing coherent sources in new spectral regions. During this contract period work has been

active on the general areas of tunable parametric processes, in techniques for generation of ultraviolet and vacuum ultraviolet radiation, in studies of techniques for up-converting infrared radiation, and in theoretical and experimental studies of excimer laser systems. GRA

N75-21626# Naval Research Lab., Washington, D.C.
LASER TARGET MODEL Interim Report
D. G. Colombant, K. G. Whitney, N. K. Winsor, J. Davis, and D. A. Tidman Dec. 1974 49 p refs
(NRL Proj. H02-30; DNA Proj. NWED-PF-001)
(AD-A002956; NRL-MR-2954) Avail: NTIS CSCL 20/9

A numerical simulation model is described for the dense hot plasma produced in the interaction of a focused laser pulse with a target of moderate atomic weight. Specific results are given for the line and continuum X-ray emission, together with other parameters of the plasma, for the case of an aluminum target. GRA

N75-21627# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
OPTICAL PROPERTIES OF INFRARED TRANSMITTING MATERIALS (LQ-10 HIGH POWER LASER WINDOW PROGRAM) Interim Report
Bendow Bernard Aug. 1973 38 p refs Presented at the Conf. on Prepn. and Properties of Electron Mater., Las Vegas, Nev., 26-29 Aug. 1973
(AF Proj. 3326)
(AD-A003397; AFCRL-TR-74-0576) Avail: NTIS CSCL 20/5

The choice of appropriate infrared transmitting materials for high-power laser applications necessitates a knowledge of various optical parameters. It has become important to be able to predict optical parameters from either theoretical or phenomenological models. Considerable progress has been made recently, especially with regard to the frequency dependence of refraction, absorption alpha and photoelasticity. It has been found, for example, that frequency dispersion is important at 10.6 micrometers for all three of the latter quantities in most alkali-halides. For most semiconductors, on the other hand, only the effects on alpha are significant. The mix of existing experimental data with recent theory is now providing us with a view of the magnitude, frequency dependence, and temperature dependence of optical parameters of infrared transmitting materials. GRA

N75-21628# Stanford Univ., Calif. Microwave Lab.
RESEARCH STUDIES ON LASER HARMONIC GENERATION Annual Report
Dec. 1974 39 p refs
(Contract N00014-67-A-0112-0036; NR Proj. 016-106)
(AD-A003047; SU-ML-2382) Avail: NTIS CSCL 20/5

The objective of work on this program is to develop techniques for the generation of coherent vacuum ultraviolet and soft X-ray radiation. The following topics are discussed: Nonlinear optical processes by van der Waals interaction during collision; Vacuum ultraviolet holography; Generation of tunable picosecond VUV radiation; Harmonic generation at high field strengths, frequency shifts and saturation phenomena; Conversion efficiency of harmonic generation processes in the presence of frequency shifts. GRA

N75-21629# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
IR WINDOW STUDIES Quarterly Technical Report
Ferdinand A. Kroger and John H. Marburger 15 Jun. 1974 102 p refs
(Contract F19628-72-C-0275; ARPA Order 2055)
(AD-A003393; USCEE-476; QTR-8; AFCRL-TR-74-0441) Avail: NTIS CSCL 20/5

Contents: Epitaxial growth of semi-insulating GaAs from Ga solutions; Optimization of alkali halide window materials; Fabrication of polycrystalline IR window materials; Mechanical behavior and dielectric constant measurements; Study of defects in CdTe; Theoretical studies of absorption mechanism in IR window materials; Wavelength and temperature dependent calorimetry measurements on GaAs; Alkali halide (KCl) surface studies with acoustic probe techniques; Absorption studies of CdTe and ZnSe; Characterization of optical performance of IR window systems; Initial investigation of the role of inclusion damage in the failure of 10.6 micrometer optics. GRA

N75-21630# Naval Research Lab., Washington, D.C.
GAMMA-RAY LASERS (GRASERS) Status Report
Leslie Cohen Dec. 1974 32 p refs
(NRL Proj. 66H01-09; RR0020641)
(AD-A002955; NRL-MR-2947) Avail: NTIS CSCL 20/5

The concept of the graser of gamma-ray laser is discussed. The difficulties in building a gamma-ray laser are outlined and specific recommendations are made for delimiting the extent of NRL involvement in graser research in the future. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-21631* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH SPEED, SELF-ACTING SHAFT SEAL Patent
Lawrence P. Ludwig and William F. Hady, inventors (to NASA) Issued 1 Apr. 1975 6 p Filed 19 Jul. 1973 Supersedes N73-29457 (11 - 20, p 2422)
(NASA-Case-LEW-11274-1; US-Patent-3,874,677; US-Patent-Appl-SN-380630; US-Patent-Class-277-27; US-Patent-Class-277-40; US-Patent-Class-277-134) Avail: US Patent Office CSCL 11A

A high-speed, self-acting circumferential type shaft seal for use in turbine engines is disclosed. One or more conventional circumferential ring seals having a central aperture are mounted in a housing. In three of the four embodiments of the invention, a helical groove and one or more dam seals are cut in the inner cylindrical surface of the one or more ring seals. In a fourth embodiment, two or more lift pads are disposed in surface contact with the inner cylindrical surface of the seal rings. To the outside of the lift pads, two dam seals are cut in the inner cylindrical surface of two of the ring seals. In each of the embodiments, a net outward radial force was produced during rotation of the turbine causing the ring seals to lift out of contact with the turbine shaft to minimize wear of the ring seals.
Official Gazette of the U.S. Patent Office

N75-21632 Polish Academy of Sciences, Warsaw.
MOVEMENT OF A SHAFT OF NONLINEAR ELASTIC PROPERTIES AND OF INTERNAL FRICTION [RUCH WALU O NIELINIOWYCH WLASNOSCIACH SPREZYSTYCH I TARCIA WEWNETRZNEGO]
Agnieszka Muszxnska 1973 33 p refs In POLISH
(Rept-26/1973) Avail: Issuing Activity

Equations of motion for spinning waves was nonlinear elastic properties and in internal damping were examined. It was assumed that the mass is distributed in continuous manner along the wave axis. A detailed solution was found for the equations, which describes synchronous and asynchronous precession of the waves, and is analyzed during specific boundary conditions. The amplitude, phase, and frequency of the precession can be determined from corresponding algebraic equations. The Galerkin method is also discussed. Transl. by M.J.S.

N75-21633*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE AERODYNAMIC DESIGN OF A COMPRESSOR-DRIVE TURBINE FOR USE IN A 75 kw AUTOMOTIVE ENGINE
Richard J. Roelke and Kerry L. McLallin Apr. 1975 39 p refs
(NASA-TM-X-71717) Avail: NTIS HC $3.75 CSCL 21A

The design of a single stage axial-flow turbine with a tip diameter of 11.15 cm is presented. The design specifications are given, and the aerodynamic design procedure is described. The aerodynamic information includes the results of flow path, velocity diagram, and blade profile studies. Predicted off-design performance characteristics are also presented. Author

N75-21634# Aeronautical Research Labs., Melbourne (Australia).
CONSTANT VOLUME GAS TURBINE COMBUSTION

EXPERIMENTS WITH STRATIFIED GASEOUS FUEL CHARGES
B. G. Catchpole, A. Runacres, and M. Zockel Jul. 1974 26 p refs
(ARL/ME-Note-351) Avail: NTIS HC $3.75

A feasibility study is presented of the pulsed combustion process which would be required for a gas turbine engine utilizing the constant volume cycle. The testing of three stratified charge combustors which were supplied with air through a continuously rotating butterfly valve is described. Some simple experiments with stratified charges in sealed combustion bombs are reported. The fuel used was propane gas and the overall fuel-air ratio of interest was up to one-third stoichiometric. Mixture stratification produced better combustion efficiency in the butterfly-valved combustors than in previous experiments, but the best combustion efficiency achieved was about 60%. These results, comfirmed by the bomb experiments, suggest that gas movements in the combustor during combustion cause some of the unburnt charge to be dissipated into the dilution region, resulting in inefficient combustion. It is concluded that progressive injection and combustion of fuel may hold more promise than combustion of stratified charges when burning relatively weak mixtures under constant-volume conditions. Author

N75-21635*# Systems Research Lab., Champaign, Ill.
RESEARCH STUDY ON STABILIZATION AND CONTROL MODERN SAMPLED-DATA CONTROL THEORY. ANALYSIS AND DESIGN OF THE DIGITAL LARGE SPACE TELESCOPE SYSTEM Bimonthly Report
B. C. Kuo 1 Mar. 1975 44 p refs
(Contract NAS8-29853)
(NASA-CR-120738) Avail: NTIS HC $3.75 CSCL 20F

Dynamic modeling of a low cost single axis LST system and the pointing stability of that system are investigated. The effects of nonlinear friction of the bearings of the reaction wheels, quantization, and sensor noise on the pointing error are covered. In addition, data are given on self sustained oscillations of the system induced by quantization and methods of evaluating attitude error of the digital LST. Author

N75-21636*# Clemson Univ., S.C. Dept. of Mechanical Engineering.
PARAMETRIC TEST OF A ZIRCONIUM (4) OXIDE-POLYACRYLIC ACID DUAL LAYER HYPERFILTRATION MEMBRANE WITH SPACECRAFT WASHWATER Final Report, Aug. 1973 - Aug. 1974
C. A. Brandon, J. L. Gaddis, and Ali M. El-Nashar Jan. 1975 62 p refs
(Contract NAS9-13669)
(NASA-CR-141755; T-932-5-1) Avail: NTIS HC $4.25 CSCL 13K

Performance data consisting of solute rejections and product flux were measured, as dependent on the operation parameters. These parameters and ranges were pressure (500,000 n/m2 to 700,000 n/m2), temperature (74 C to 95 C), velocity (1.6 M/sec to 10 M/sec), and concentration (up to 14x). Tests were carried out on analog washwater. Data presented include rejections of organic materials, ammonia, urea, and an assortment of ions. The membrane used was deposited in situ on a porcelain ceramic substrate. Author

N75-21637*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FABRICATION OF HOLLOW ELASTOMERIC BODIES Patent Application
Howard F. Broyles (JPL), Jovan Moacanin (JPL), and Edward F. Cuddihy, inventors (to NASA) (JPL) Filed 28 Mar. 1975 14 p
(Contract NAS7-100)
(NASA-Case-NPO-13535-1; US-Patent-Appl-SN-563050) Avail: NTIS HC $3.25 CSCL 13K

Annular elastomeric bodies having intricate shapes are cast by dipping a heated, rotating mandrel into a solution of the elastomer. The elastomer is premitted to creep into sharp recesses, drying the coated mandrel and repeating the operation until the desired thickness was achieved. A bladder for a heart assist pump in which cylindrical body terminating in flat, sharp horizontal flanges was subjected to over 2,500 hours of simulated life conditions with no visible signs of degradation. NASA

N75-21638*# Kanner (Leo) Associates, Redwood City, Calif.
TABLE OF CONTENTS AND ABSTRACTS OF MEKHANIKA MASHIN, NO. 45, 1974
I. I. Artobolevskiy, ed. Washington NASA Mar. 1975 11 p Transl. into ENGLISH from the book "Mekhanika Mashin, no. 45, 1974" Moscow, Nauka Press, 1974 p 144-147
(Contract NASw-2481)
(NASA-TT-F-16178) Avail: NTIS HC $3.25 CSCL 13I

Abstracts are presented on gears, gear teeth, and transmissions. Worm cutters for machining rotors, stepped belt drive, and belt winding are also included. J.A.M.

N75-21639# Sandia Labs., Albuquerque, N.Mex.
FABRICATING CLOSED CHANNELS BY ELECTROFORMING
H. R. Johnson and J. W. Dini Sep. 1974 34 p refs Presented at the Electroforming Symp., Atlanta, 9-10 Dec. 1974
(Contract AT(29-1)-789)
(SAND-74-8502; Conf-741206-1) Avail: NTIS HC $3.75

Techniques for producing closed channels by electroplating are described; they are plating in channels, the diffusion technique, and plating across open channels. These techniques permit closed channels of different sizes to be created; openings as small as 750 square microns (equivalent to the area of a wire 0.0013 inch in diameter) were fabricated with the plating-in-channels method. Where large channels are required, the plating-across-open-channels technique can be used. Author (NSA)

N75-21640# Los Alamos Scientific Lab., N.Mex.
INVESTIGATIONS ON POTENTIAL CONDUCTORS FOR A dc SUPERCONDUCTING POWER TRANSMISSION LINE IN A 20 METER TEST BED
J. K. Hoffer 30 Sep. 1974 5 p refs Presented at the Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. - 2 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1443; Conf-740957-14) Avail: NTIS HC $3.25

The cryogenic and electrical aspects of a program to evaluate superconductors for a dc superconducting power transmission line are presented. Results for conductors in lengths of 20 meters operated at currents up to 10 kA are described. A battery driven power supply which is capable of delivering and controlling currents up to 50 kA is discussed. Specific experiments are discussed which have been designed to probe the response of the conductors to a variety of thermal and electrical conditions, such as: thermal gradients over the length of the conductor, single and two phase flow of cryogen, loss of coolant flow, operation at temperatures near T sub c, a.c. ripple current, and high current ramping rates. Author (NSA)

N75-21641# Los Alamos Scientific Lab., N.Mex.
BRAZE WELD JOINTS FOR VACUUM SYSTEM ASSEMBLIES
R. D. Clayton Oct. 1974 5 p
(Contract W-7405-eng-36)
(LA-5766-MS) Avail: NTIS HC $3.25

A method of tungsten inert gas (TIG) welding using brazing alloys has been developed, which has particular utility for vacuum system assemblies. The technique is presented as a suitable alternative to other procedures for certain applications. Experience with this technique on LAMPF linac components is discussed. Author (NSA)

N75-21642# SKF Industries, Inc., King of Prussia, Pa.
FEASIBILITY OF INDUCTION SKIN HARDENED TAPERED ROLLER BEARINGS FOR ENGINE MAIN SHAFT AND TRANSMISSION PINION APPLICATIONS Final Technical Report, 2 Oct. 1972 - 2 Jul. 1974
J. W. Rosenlieb, H. M. Martinie, and R. E. Maurer Nov. 1974 71 p refs
(Contract DAAJ02-73-C-0009; DA Proj. 1F2-62209-AH-76)
(AD-A003314; SKF-AL74T023; USAAMRDL-TR-74-90) Avail: NTIS CSCL 13/9

The purposes of this program were (1) to improve the design of ultrahigh-speed tapered roller bearings based on the computer analyses and test results previously reported under Contract DAAJ02-70-C-0047, and (2) to develop the required technology to induction skin harden M-50 tool steel rings of relatively thin

cross section for use in the manufacture of aircraft rolling bearings. GRA

N75-21643# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PROBLEMS OF COMBUSTION IN DIESEL ENGINES
N. Kh. Dyachenko and Yu. B. Sviridov 19 Nov. 1974 25 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 254-264
(AD-A002822; FTD-MT-24-1884-74) Avail: NTIS CSCL 21/2

Pecularities in combustion and carburetion are discussed based on numerous experimental data. It is shown that the fuel spray has a structure characterized by the fact that the processes of heat exchange, vaporization and the slowing down of particles occur only in the frontal zone where the fuel particles encounter fresh medium. M.C.F.

N75-21644# Army Materials and Mechanics Research Center, Watertown, Mass.
WELDING AND EXPLOSIVE BONDING OF A HIGH HARDNESS ARMOR STEEL: A MECHANICAL AND BALLISTIC PROPERTY EVALUATION Final Report
Richard Chait, William P. Hatch, and Charles H. Curll Oct. 1974 21 p
(AD-A003423; AMMRC-TR-74-27) Avail: NTIS CSCL 11/6

This effort is concerned with the mechanical and ballistic behavior of both butt and corner weldments of air-melted laminar composite armor steel. Weld filler metal composition for these weldments is given. The baseline strength properties are presented and compared with baseline mechanical properties of unwelded material. Extent of ballistic damage as a result of impact with .30 cal. ball and AP projectiles is obtained in terms of maximum lateral damage (MLD) defined as the maximum amount of damage measured transverse to the loading direction. Residual strength of ballistically damaged specimens is obtained and analyzed in terms of MLD. An additional joining technique that could simplify the construction of structural attachments is also discussed. This technique is explosive bonding of aluminum to the high hardness armor steel. Mechanical and ballistic behavior of explosively bonded composite are evaluated. GRA

N75-21645# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
THE RESISTANCE OF POROUS ASPHALT AND ANTIHYDROPLANING SURFACES TO ENVIRONMENTAL EFFECTS AND SIMULATED AIRCRAFT WHEEL LOADINGS Final Report, 1 Sep. - 31 May 1974
Emil Hargett Nov. 1974 56 p refs Sponsored by the AF
(AD-A003420; AFWL-TR-74-169) Avail: NTIS CSCL 01/5

The resistance of test strips of porous asphalt and several other antihydroplaning surfaces to environmental effects and simulated aircraft wheel loadings is described. The report shows that porous asphalt and porous asphalt with a rubber additive are the most promising antihydroplaning materials currently available and that, for various reasons, the other antihydroplaning surfaces tested were marginally acceptable or unacceptable. GRA

N75-21646# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
WATER INDUCTION STUDIES IN A MILITARY SPARK IGNITION ENGINE Interim Report, Jun. - Sep. 1974
J. V. Moffitt and S. J. Lestz Oct. 1974 44 p refs
(Contract DAAD05-72-C-0053)
(AD-A003332; AFLRL-46) Avail: NTIS CSCL 21/7

Dynamometer studies were conducted at the U.S. Army Fuels and Lubricants Research Laboratory in an L-141 military SI engine to evaluate the effects of intake port water induction on fuel economy, power, and exhaust emissions. The engine was equipped with a variable jet carburetor to permit independent control of mass fuel and air flow as required by the constant speed-constant fuel flow-variable air flow technique used, and the intake manifold was reworked to accommodate a water induction tube at each port. Crankcase emission controls were deleted to avoid blow-by contamination of the intake charge, and the fan and radiator were replaced by a water-to-water heat exchanger in a vented cooling system charged with treated tap water. Specification VV-G-001690 Special Grade unleaded gasoline and a MIL-L-2104 C grade 30 oil were selected as the reference fuel and lubricant, while de-ionized water was used for induction purposes. GRA

N75-21647# Michigan Dept. of State Highways and Transportation, Lansing. Research Lab. Section.
PROTECTIVE COATINGS FOR HIGHWAY METALS Final Report
A. J. Permoda and A. R. Gabel Jun. 1974 79 p Prepared for Federal Highway Administration, Washington, D. C.
(PB-238277/8; R-916) Avail: NTIS HC $4.75 CSCL 13C

This report relates steps taken to minimize coatings maintenance on metal appurtenances, particularly steel beam guardrail, bridge railings, and bridge structural steel girders. It was found that galvanizing guardrail and bridge railings yields a coating system that protects the materials at least twice as long as paints. A variety of alternative railing materials were tried including aluminum-alloy, unpainted low alloy steel, and concrete. For coating bridge structural steel girders, laboratory screening tests were conducted on paint systems followed by in-service tests of the superior systems. Various coatings systems and specification revisions are discussed. GRA

N75-21648# British Steel Corp., Sheffield (England). Information Services.
BIBLIOGRAPHY ON TIN FREE STEEL (TFS)
J. Sloan Dec. 1974 16 p
(PB-238801/5; SM/BIB/909) Avail: NTIS HC $3.25 CSCL 13D

The bibliography contains seventy four briefly annotated references divided into three sections, viz:-(1) general articles, (2) chromium/chromium oxide coatings (3) can manufacture. World TFS lines and companies holdings TFS licences are tabulated, and an author/company index is provided. GRA

N75-21649# British Steel Corp., Sheffield (England).
THE WELDING OF THE COR-TEN WEATHERING STEELS Information Services
C. Sheach and W. P. Tait Dec. 1974 19 p
(PB-238796/7; GS/PROD/MISC/79/74/C) Avail: NTIS HC $3.25 CSCL 11F

The object of the work detailed in this paper was to compare experimentally, specific aspects of the weldability of the Cor-ten steels with those of carbon-manganese steels of similar strength levels and carbon equivalent values in order to confirm past practical experience on the welding of the weathering steels and to clarify any doubt or uncertainties that still exist concerning their weldability. Two major weldability aspects, appropriate for these steels as for other high strength structural steels, the hydrogen cracking susceptibility and the solidification cracking susceptibility have been investigated. Also highlighted are other aspects of specific interest and importance. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-21650*# Michigan Univ., Ann Arbor.
THEORY OF RELIABLE SYSTEMS Final Report, 1 Jan. - 31 Dec. 1974
John F. Meyer Apr. 1975 28 p refs
(Grant NGR-23-005-622)
(NASA-CR-142608) Avail: NTIS HC $3.75 CSCL 14D

An attempt was made to refine the current notion of system reliability by identifying and investigating attributes of a system which are important to reliability considerations. Techniques which facilitate analysis of system reliability are included. Special attention was given to fault tolerance, diagnosability, and reconfigurability characteristics of systems.

N75-21651*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
COMPUTATION-BASED RELIABILITY ANALYSIS Final

Technical Report, 1 Jan. - 31 Dec. 1974
J. F. Meyer Jan. 1975 34 p refs
(Grant NGR-23-005-622)
(NASA-CR-142615; UMICH-012146-2-T; SEL-TR-83) Avail: NTIS HC $3.75 CSCL 14D

The structural and functional complexity of man-made systems is reported, showing the reliability analysis task becoming much more complex. Quantative methods are discussed for analyzing system quality. The reliability equations that are developed for systems employing modular redundancy and sparing are discussed to illustrate the need for computation-based reliability analysis.
M.C.F.

N75-21652# California Univ., Livermore. Lawrence Livermore Lab.
ACOUSTIC EMISSION VS STRAIN AND STRAIN RATE: MEASUREMENT AND A DISLOCATION THEORY MODEL FOR A DISPERSION-STRENGTHENED ALUMINUM ALLOY
M. A. Hamstad and A. K. Mukherjee 5 Oct. 1974 33 p refs
Presented at Fall Conf. of Am. Soc. for Nondestructive Testing, Detroit, 21 Oct. 1974 Sponsored by ERDA
(UCRL-76077; Conf-741074-1) Avail: NTIS HC $3.75

The essential character of the continuous acoustic emission generated during a tensile test of 7075-T6 aluminum was studied. Measurement of this continuous acoustic emission by a true rms meter is discussed. The question of subtracting the background electronic noise from the acoustic emission signal is considered, as well as the question of the strain rate sensitivity of continuous acoustic emission in this alloy. A theory describing the dependence of rms on strain and strain rate is derived using a dislocation theory model and the measurement characteristics of the rms meter. It is concluded that rms is proportional to the square root of the plastic strain rate, but that this half power dependence is not a material constant. Author (NSA)

N75-21653# General Electric Co., Syracuse, N.Y. Electronics Lab.
RELIABILITY STUDY OF MICROWAVE TRANSISTOR PACKAGING Interim Report, Jan.-Aug. 1974
Donald J. LaCombe and Ronald J. Naster Dec. 1974 77 p refs
(Contract F30602-74-C-0128; AF Proj. 5519)
(AD-A003338; RADC-TR-74-306) Avail: NTIS CSCL 09/1

The report presents the results of the first seven months of effort on a program to evaluate the influence of the package on the reliability of microwave power transistors. Emphasis in this study is placed on the effect of the package on the device reliability and not on the package itself. Several different aspects of the problem are being studied simultaneously. They include: stress tests on available modules; determining the effect of wire movement on the device performance; and determining the influence of the external circuit impedance on junction temperature and device performance. In addition, a vendor survey has been carried out and available carriers are being characterized to determine design integrity and quality of construction. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N75-21654 California Univ., San Diego.
UPPER AND LOWER BOUNDS FOR INFLUENCE COEFFICIENTS OF CANTILEVER BEAMS IN A STATE OF PLANE STRESS AND OF EDGE-LOADED CIRCULAR CYLINDRICAL SHELLS Ph.D. Thesis
Sudhakar Nair 1974 155 p
Avail: Univ. Microfilms Order No. 75-4649

Upper and lower bounds are obtained for influence coefficients for orthotropic cantilever beams under transverse end loads, treated as a problem of plane stress; and for end-loaded, semi-infinite, transversely isotropic cylindrical shells treated as a problem of rotationally symmetric deformations. Simultaneous use of the principles of minimum potential and complementary energy yields the appropriate bound functions for these two problems. The upper and lower bound formulas obtained for the beam problem coincide for the limiting case of vanishing depth-to-span ratio of the beam, representing in effect a rigorous proof of the correctness of the elementary strength of materials results for the case of a very slender beam. In addition to this, quantitatively reliable corrections are obtained to the elementary results for the case of beams which are not slender.
Dissert. Abstr.

N75-21655 Texas A&M Univ., College Station.
CRITERION FOR FAILURE UNDER REVERSED TRANSVERSE SHEAR SUPERIMPOSED UPON STATIC TENSION Ph.D. Thesis
Mofstafa Esphahani 1974 67 p
Avail: Univ. Microfilms Order No. 75-2847

The combined effect of mean static stress and reversed shear stress on the fatigue life of aluminum alloy 7075T6 was tested under different combinations of reversed shear and static tension. For application of the reversed shear load, specimens were tested at three levels of loading taken as percentages of the static rupture shear load. The static rupture shear load was determined by statically loading the specimen until it ruptured. Superposition of mean static stress (tension) resulted in considerable reduction in permissible amplitude of the reversed shear stress. The failure relationship between reversed shear stress and static tension was found to be linear. Under such conditions failure may be predicted by a general criterion which expresses the octahedral shear stress as a linear function of the sum of normal stresses. Dissert. Abstr.

N75-21656 State Univ. of New York, Buffalo.
DYNAMIC RESPONSE OF A PRESTRESSED ELASTIC PLATE TO A MOVING LOAD Ph.D. Thesis
Alfred A. Adler 1974 79 p
Avail: Univ. Microfilms Order No. 75-1460

The dynamic response of an infinite prestressed plate strip under an arbitrarily distributed transverse moving line load is determined. The line of application of the load is perpendicular to the infinite edges of the plate, and the load is assumed to propagate parallel to the infinite edges at constant speed. The constant, uniform prestress acts in the plane of the plate in a direction parallel to the infinite edges. The problem is formulated as a boundary value problem within the framework of a plate theory which includes the effects of shear deformation and rotatory inertia. A closed form solution, in terms of elementary functions, is obtained for each harmonic component of the line load by the Fourier transform method in conjunction with contour integration. It is shown that the resulting deflection profile of the plate depends strongly on the speed of propagation of the load as well as on the magnitude and sense of the prestress.
Dissert. Abstr.

N75-21657 Colorado Univ., Boulder.
ANALYTICAL AND EXPERIMENTAL INVESTIGATIONS IN LINEAR ISOTROPIC MICROPOLAR ELASTICITY Ph.D. Thesis
Richard David Gauthier 1974 159 p
Avail: Univ. Microfilms Order No. 75-3782

The six elastic constants of a micropolar solid can be determined through a set of experiments including uniaxial tension or compression of a circular cylinder, torsion of a circular cylinder, and pure bending of a flat plate. Analytical calculations predict that three of the six elastic constants can be determined from torque-twist measurements on three cylinders whose diameters are 10, 7.5, and 5 particle diameters, respectively. Two other constants are provided by a conventional tensile test as in classical elasticity. The remaining constant should be found from pure bending of a flat plate whose thickness is 10 particle diameters. Dissert. Abstr.

N75-21658 Lehigh Univ., Bethlehem, Pa.
STRUCTURAL DAMPING IN BEAMS, PLATES, AND SHELLS Ph.D. Thesis
Tuncer Toprak 1974 163 p
Avail: Univ. Microfilms Order No. 75-4741

Structural damping is defined and different types of damp-

ing mechanisms are classified and explained. The importance of these mechanisms is clarified. Various mathematical models which were proposed to present the damping behavior of continuous systems are discussed and disadvantages of these models for free vibration problems are clarified. A mathematical model which satisfies both free and forced vibrations is proposed. Application of this model to beam, plate and cylindrical shell has been carried out. Damping factor in terms of energy concepts is defined for cylindrical shell. The effects of the thickness of the viscoelastic damping layer on the main plate is investigated and the change of damping factor with thickness ratio of viscoelastic layer to main layer was found. The transient vibration of a beam and shell with a step external load is solved and the expansion of the solution for damped vibration was found. Dissert. Abstr.

N75-21659 Lehigh Univ., Bethlehem, Pa.
FATIGUE CRACK GROWTH UNDER VARIABLE AMPLITUDE LOADING Ph.D. Thesis
True-Tsai Shih 1974 151 p
Avail: Univ. Microfilms Order No. 75-4738

Comprehensive studies of load interaction effects on fatigue crack growth have been carried out on a single plate of mill annealed Ti-6Al-4V alloy over a broad range of loading variables at room temperature. The effects of temperature and thermal history, and of environment on delay were also examined. The effect of specimen thickness on delay was also studied by using 7075-T6 aluminum alloy plates. Inferences regarding the probable cause for load interaction effects were discussed. The application of these results in estimating crack growth behavior under block-programmed loads was considered. Experimental results show that the load interaction phenomenon (delay) is quite complex, and that delay is a function of the magnitude and range of the high loads, as well as of the subsequent lower loads, the number of high load cycles, the ratio between the high and low loads, stress ratio, etc. Dissert. Abstr.

N75-21660 Cincinnati Univ., Ohio.
TRANSIENT RESPONSE ANALYSIS OF CYLINDRICAL SHELLS BY THE WILLIAM'S AND MODAL SUPERPOSITION METHODS Ph.D. Thesis
Subhash Chandra 1974 148 p
Avail: Univ. Microfilms Order No. 75-2547

The dynamic response of cylindrical shells of circular cross section is studied. Governing equations of motion are derived for orthotropic cylindrical shells using Flugge's simplified theory. Classical simple support boundary conditions are assumed. Axisymmetric and nonsymmetric loading functions which are separable in time and space are considered. The forced response is obtained by using the modal superposition method and the William's method. Various loading functions, ranging from gentle in space to severe, are considered and the displacement and strain response history of the shell is obtained by both the methods. It is found that the convergence behavior of the response is, in general, worse than the displacement response. Dissert. Abstr.

N75-21661 Drexel Univ., Philadelphia, Pa.
A THEORETICAL STUDY OF YIELDING AND INELASTIC BEHAVIOR OF LAMINATED MEDIA Ph.D. Thesis
David Kea-Kuo Chou 1975 274 p
Avail: Univ. Microfilms Order No. 75-6121

A yield criterion for laminated media was obtained, and it was shown that for the laminated media with isotropic layers, the criterion of Tsai and Wu is a direct extension of von Mises'. The yield surface for laminated media may be formed by many intersecting ellipsoids may be an ellipsoid enclosed by many larger ones. A set of equations is presented governing the relative positions of the ellipses. A general expression of the yield conditions was obtained for the laminated media composed of generally anisotropic layers. A mathematical model was developed to investigate the post-yielding behavior of laminated media composed of isotropic layers. The formulation includes two methods of analysis, the incremental stress theory and the deformation theory. A nonlinear plastic stress-strain relation is derived for each method. The yield surfaces expressed by Tsai and Wu equation in different coordinate systems were investigated. Dissert. Abstr.

N75-21662 Cincinnati Univ., Ohio.
THE THREE DIMENSIONAL TRUNCATED HOLLOW OR SOLID CONE UNDER AXISYMMETRIC OR NON-AXISYMMETRIC END LOADING Ph.D. Thesis
Rocque Fernandes 1975 127 p
Avail: Univ. Microfilms Order No. 75-5315

The cone is subjected to either axisymmetric or nonaxisymmetric end loading, all other surfaces being stress free. Three stresses prescribed on the end surface and three auxiliary stress-type variables were formulated making systematic use of the stress equations of equilibrium and the Beltrami equations of compatibility. A separation of variables of the resulting vector partial differential equation yields a nonself-adjoint vector ordinary differential equation, so that the eigenstresses are nonorthogonal. The generalized biorthogonality condition is derived for the nonaxisymmetric case, which permits the numerical determination of the Fourier coefficients of a vector eigenstress expansion. The first few eigenvalues of the nonaxisymmetric solid cone are presented for various indices of nonaxisymmetry and various cone angles. Dissert. Abstr.

N75-21663 City Univ. of New York.
MATHEMATICAL ANALYSIS OF ELASTIC BELLOWS WITH WELDED CONSTRAINTS Ph.D. Thesis
Nicholas Vasilios Kountouras 1974 167 p
Avail: Univ. Microfilms Order No. 75-5485

A method is formulated which may be applied to the analysis of any precision welded bellows. The method, which involves the direct solution of the full linear shell equations by numerical integration coupled with a theory of the deformation of axisymmetric tori, is used to make an extensive study of precision welded bellows. Although the method is applicable to any shape bellows, in order to present quantitative results, the method was applied to a specific shape consisting of cones and plates. Therefore, all graphs and quantitative results presented only apply to this one shape. This specific type of precision welded bellows, presently employed in numerous industrial and scientific applications, is analyzed when subject to an axial force. Dissert. Abstr.

N75-21664 Wisconsin Univ., Madison.
DYNAMIC MODELING OF ROTATING ELASTIC SYSTEMS CONTAINING MOVING PARTS Ph.D. Thesis
George Thomas Kroncke 1974 124 p
Avail: Univ. Microfilms Order No. 74-28811

The generalized equations of motion are developed from Newton's laws and Euler's equation of rotational motion for a system of elastically interconnected rigid bodies and bodies whose relative motions are prescribed. The equations are presented in a form conducive to ease in understanding and computer implementation. These generalized equations are simplified and then applied to mathematical models of a flexible space station containing a moving mass. Special cases where the principle of conservation of angular momentum may be used to advantage are discussed. The simplified general equations are linearized for small deflections in order to achieve an analytic solution. The linearized equation of rotational rate is in the form of Hill's differential equation which can be reduced to the Mathjeu equation for special cases. Dissert. Abstr.

N75-21665 Wisconsin Univ., Madison.
LARGE DEFLECTION EQUATIONS OF ELASTICITY AND BUCKLING OF CYLINDRICAL SHELLS Ph.D. Thesis
Swapan Majumdar 1974 116 p
Avail: Univ. Microfilms Order No. 74-28817

The general equations of equilibrium of three dimensional elasticity in curvilinear coordinates are derived. These coordinates are especially suited for the description of shells. The equations are equally valid for the geometric and the material nonlinearity. Instead of introducing the approximations of the two-dimensional theory, emphasis is given to invariance principles of the field theory of mechanics. Equations are developed in terms of displacement functions with reference to the natural configuration. In order to achieve this goal the algebra of two point tensor field is exploited. Final equations derived are highly nonlinear and are beyond the scope of analytical solution. Depending on the extent of knowledge of the material properties the governing equations may be developed for the particular cases such

as infinitesimal elasticity, Mooney-Rivlin material et cetera.
Dissert. Abstr.

N75-21666 Rensselaer Polytechnic Inst., Troy, N.Y.
INVESTIGATION OF MICROSEGREGATION DURING SINTERING OF A BINARY ALLOY Ph.D. Thesis
Amarendra Mishra 1974 152 p
Avail: Univ. Microfilms Order No. 75-5390

Microsegregation during sintering of binary alloys was studied with the help of an electronmicroprobe. Homogeneous, 12 wt.% gold and silver alloy wires were sintered at 740 C, 802 C, and 849 C for different lengths of time. The cross section of the neck between the wires was examined to determine the concentration at different points in and adjacent to the neck. It was concluded that the initial neck growth as well as segregation takes place by surface diffusion and that back diffusion occurs by a combination of surface and volume diffusion. With increasing time, volume diffusion becomes more important. Grainboundary diffusion is not an important mechanism for material transport during the period over which segregation takes place. In general, direct measurements of segregation were made and definite conclusions are drawn with regard to the mechanisms responsible for segregation. Dissert. Abstr.

N75-21667 Rensselaer Polytechnic Inst., Troy, N.Y.
FRACTURE IN A DIRECTIONALLY SOLIDIFIED NICKEL-(CHROMIUM)-TANTALUM CARBIDE FIBROUS EUTECTIC UNDER MONOTONIC AND CYCLIC LOADING Ph.D. Thesis
Michael F. Henry 1974 324 p
Avail: Univ. Microfilms Order No. 75-5385

High temperature directionally solidified eutectics were identified as potential candidate materials for future gas turbine applications. The fracture behavior, under monotonic and cyclic loading, of a Ni(Cr)-TaC model system was studied. The tensile behavior was examined from room temperature to 1000 C. The internal thermally induced residual stresses due to the large difference in thermal expansion coefficients of the two aligned phases was calculated and experimentally verified. At room temperature, the matrix has 45 ksi tension and the fibers 800 ksi compression residual stress. These stresses disappear at approximately 1075 C. In tension, the TaC fibers fracture initially due to pile-up of matrix slip bands on /111/ planes against the fibers. Significant fiber failure at 25 and 1000 C occurs at 1.3 and 1.0% strain, respectively. The composite undergoes significant deformation after fiber failure with true strain at failure ranging from 80% at 25 C to 60% at 1000 C. The decrease in ductility is due to diminished strain hardening capacity with increasing temperature. Dissert. Abstr.

N75-21668*# Martin Marietta Aerospace, Orlando, Fla.
LIFE PREDICTION OF MATERIALS EXPOSED TO MONOTONIC AND CYCLIC LOADING: BIBLIOGRAPHY
James L. Carpenter, Jr., Nestor Moya, and William F. Stuhrke Jan. 1975 73 p refs
(Contract NAS3-17640)
(NASA-CR-134751; OR-13320) Avail: NTIS HC $4.25 CSCL 20K

This bibliography is comprised of approximately 1200 reference citations related to the mechanics of failure in aerospace structures. Most of the references are for information on life prediction for materials exposed to monotonic and cyclic loading in elevated temperature environments such as that in the hot end of a gas turbine engine. Additional citations listed are for documents on the thermal and mechanical effects on solar cells in the cryogenic vacuum environment; radiation effects on high temperature mechanical properties; and high cycle fatigue technology as applicable to gas turbine engine bearings. The bibliography represents a search of the literature published in the period April 1962 through April 1974 and is largely limited to documents published in the United States. It is a companion volume to NASA CR-134750, Life Prediction of Materials Exposed to Monotonic and Cyclic Loading - A Technology Survey.
Author

N75-21669*# Martin Marietta Aerospace, Orlando, Fla.
LIFE PREDICTION OF MATERIALS EXPOSED TO MONOTONIC AND CYCLIC LOADING: A NEW TECHNOLOGY SURVEY
William F. Stuhrke and James L. Carpenter, Jr. Jan. 1975 214 p refs
(Contract NAS3-17640)
(NASA-CR-134750; OR-13319) Avail: NTIS HC $7.25 CSCL 20K

Reviewed and evaluated technical abstracts for about 100 significant documents are reported relating primarily to life prediction for structural materials exposed to monotonic and cyclic loading, particularly in elevated temperature environments. The abstracts in the report are mostly for publications in the period April 1962 through April 1974. The purpose of this report is to provide, in quick reference form, a dependable source for current information
Author

N75-21670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRESS ANALYSIS AND STRESS INTENSITY FACTORS FOR FINITE GEOMETRY SOLIDS CONTAINING RECTANGULAR SURFACE CRACKS
John P. Gyekenyesi and Alexander Mendelson 1975 31 p refs Proposed for presentation at Winter Ann. Meeting of the ASME, Houston, Tex., 30 Nov. - 5 Dec. 1975
(NASA-TM-X-71694; E-8296) Avail: NTIS HC $3.75 CSCL 20K

The line method of analysis is applied to the Navier-Cauchy equations of elastic equilibrium to calculate the displacement field in a finite geometry bar containing a variable depth rectangular surface crack under extensionally applied uniform loading. The application of this method to these equations leads to coupled sets of simultaneous ordinary differential equations whose solutions are obtained along sets of lines in a discretized region. Using the obtained displacement field, normal stresses and the stress intensity factor variation along the crack periphery are calculated for different crack depth to bar thickness ratios. Crack opening displacements and stress intensity factors are also obtained for a through-thickness, center cracked bar with variable thickness. The reported results show a considerable potential for using this method in calculating stress intensity factors for commonly encountered surface crack geometries in finite solids.
Author

N75-21671*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THERMAL INSULATION ATTACHING MEANS Patent Application
Lubert Leger, inventor (to NASA) Filed 5 Mar. 1975 13 p
(NASA-Case-MSC-12619-1; US-Patent-Appl-SN-555750) Avail: NTIS HC $3.25 CSCL 22B

An isolation arrangement is reported for attaching tiles of insulating material to the surface of a structure sought to be protected against extreme temperatures of the nature expected to be encountered by the space shuttle orbiter. The insulating tiles are each affixed to an isolation pad formed of closely arranted and randomly oriented fibers by means of a silicone resin adhesive. The pad, in turn, is affixed to the structure by a similar layer of silicone resin adhesive.
NASA

N75-21672*# MacNeal-Schwendler Corp., Los Angeles, Calif.
STUDY OF THE MODIFICATIONS NEEDED FOR EFFECTIVE OPERATION NASTRAN ON IBM VIRTUAL STORAGE COMPUTERS Final Report
C. W. McCormick and K. H. Render Washington NASA Apr. 1975 61 p refs Sponsored by NASA
(NASA-CR-2527) Avail: NTIS HC $4.25 CSCL 20K

The necessary modifications were determined to make NASTRAN operational under virtual storage operating systems (VS1 and VS2). Suggested changes are presented which will make NASTRAN operate more efficiently under these systems. Estimates of the cost and time involved in design, coding, and implementation of all suggested modifications are included.
Author

N75-21673*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF BONDED JOINTS
S. Srinivas Washington Apr. 1975 52 p refs
(NASA-TN-D-7855; L-9563) Avail: NTIS HC $4.25 CSCL 13E

A refined elastic analysis of bonded joints which accounts for transverse shear deformation and transverse normal stress was developed to obtain the stresses and displacements in the adherends and in the bond. The displacements were expanded in terms of polynomials in the thicknesswise coordinate; the coefficients of these polynomials were functions of the axial coordinate. The stress distribution was obtained in terms of these coefficients by using strain-displacement and stress-strain relations. The governing differential equations were obtained by integrating the equations of equilibrium, and were solved. The boundary conditions (interface or support) were satisfied to complete the analysis. Single-lap, flush, and double-lap joints were analyzed, along with the effects of adhesive properties, plate thicknesses, material properties, and plate taper on maximum peel and shear stresses in the bond. The results obtained by using the thin-beam analysis available in the literature were compared with the results obtained by using the refined analysis. In general, thin-beam analysis yielded reasonably accurate results, but in certain cases the errors were high. Numerical investigations showed that the maximum peel and shear stresses in the bond can be reduced by (1) using a combination of flexible and stiff bonds, (2) using stiffer lap plates, and (3) tapering the plates. Author

N75-21674*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

A PRIMER FOR STRUCTURAL RESPONSE TO RANDOM PRESSURE FLUCTUATIONS

E. H. Dowell and R. Vaicaitis (Columbia Univ.) Apr. 1975 41 p refs

(Grant NGR-31-001-146; NsG-1059)

(NASA-CR-142671; AMS-1220) Avail: NTIS HC $3.75 CSCL 20K

A review was made of power spectral methods for determining linear response of structures to random pressure fluctuations. Various simplifying assumptions are made for the purpose of obtaining useful formula for structural response. The transmission of sound through a flexible structure into an interior cavity was also treated. Author

N75-21675*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STRAINRANGE PARTITIONING: A TOOL FOR CHARACTERIZING HIGH TEMPERATURE LOW CYCLE FATIGUE

M. H. Hirschberg and G. R. Halford 1975 48 p refs Presented at the 40th Meeting of the AGARD Structures and Materials Panel of NATO, Brussels, 13-18 Apr. 1975

(NASA-TM-X-71691; E-8294) Avail: NTIS HC $3.75 CSCL 20K

The basic concepts of strain range partitioning are reviewed and the areas requiring for expanded verification are detailed. A suggested cooperative evaluation program involves the verification of the four basic life relationships (for PP, CC, PC, and CP type inelastic strain ranges) for a variety of materials that are of direct interest to the participating organizations. Author

N75-21676*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THE DESIGN AND USE OF AN ERROR CORRECTION INFORMATION SYSTEM FOR NASTRAN

David C. Rosser, Jr. Nov. 1974 20 p

(NASA-TM-X-72651) Avail: NTIS HC $3.25 CSCL 20K

Error Correction Information System (ECIS) is a system for a two-way transmittal of NASTRAN maintenance information via a data base stored on a nationwide accessible computer. ECIS consists of two data bases. The first data base is used for comments, reporting NASTRAN Software Problem Reports (SPR's) and bookkeeping information which can be updated by the user or the NASTRAN Office. The second data base is used by the NSMO to store all SPR information and updates. The hardware needed by an accessing user is any desktop computer terminal and a telephone to communicate with the central computer. The instruction format is an engineering oriented language and requires less than an hour to obtain a working knowledge of its functions. Author

N75-21677# National Aeronautical Establishment, Ottawa (Ontario).

A FINITE ELEMENT PROCEDURE FOR PLATES WITH CURVED BOUNDARIES

T. M. Hrudey Jan. 1975 62 p refs

(NRC-14575; LR-584; ISSN-0077-5541) Avail: NTIS HC $4.25

The difficulties involved in the finite element solution of plate problems which have curved boundaries are considered. Previously used techniques for such problems are discussed and a new procedure is suggested which overcomes the problem of satisfying the displacement boundary conditions on a curved boundary. A number of circular and elliptic plate problems are solved using two previously used techniques in addition to that proposed here. The latter is found to be superior in all cases. Author

N75-21678# Sandia Labs., Albuquerque, N.Mex.

BRITTLE FRACTURE CONSIDERATIONS OF TWO EXTERNAL NOTCHES UNDER COMBINED LOADING

M. E. Kipp and G. C. Sih (Lehigh Univ., Bethlehem, Pa.) Nov. 1974 21 p refs Presented at Soc. of Eng. Sci., Inc., Durham, N. Carolina, 11 Nov. 1974 Sponsored by ERDA

(SAND-74-5566; Conf-741128-1) Avail: NTIS HC $3.25

The interaction behavior of two external notches, modeled by plane hyperbolas, is analyzed using the strain energy failure criterion. It is shown that the pure shear and normal loadings may be combined to the case of inclined or off-axis loading of this double notch geometry. The crack trajectory emanating from the notch surface is hypothesized to follow the path of the minimum values of the strain energy density functior. The failure loads are shown to vary with the angle between the inclined load and the major axis of the notch. The variations depend on the aspect ratios of the notches. A composite plot of the crack trajectories for different loading angles is presented. The double notch geometry is such that only local trajectory information can be gleaned from the initial state. Numerical results of failure load, fracture angle, and other properties are given for notches with different degrees of bluntness. Author (NSA)

N75-21679# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.

ELASTIC AND PLASTIC DEFORMATION OF SOLIDS Annual Progress Report, 1 Feb. 1974 - 31 Jan. 1975

A. L. Ruoff 18 Oct. 1974 18 p refs

(Contract AT(11-1)-3153)

(COO-3153-126) Avail: NTIS HC $3.25

Results of stress-strain plastic flow measurements on K metal at liquid N2 temperature and up to 7.0 kbars are presented. In other work, the preparation of ultrafine grained carbides was investigated along with a capacitance method of detecting phase transformations at ultrahigh pressure, equations of state, stress concentrations in solids, and effects of Mg2(+) doping on creep of Lif. NSA

N75-21680# Sandia Labs., Albuquerque, N.Mex.

SHELL SHOCK STRUCTURAL CODE

J. E. Grant Dec. 1974 9 p refs Presented at CUBE Symp., Livermore, Calif., 23 Oct. 1974 Sponsored by ERDA

(SAND-74-8613; Conf-741001-33) Avail: NTIS HC $3.25

SHELL SHOCK is a computer code that performs a frequency analysis and determines the static and dynamic response of any structure represented by mass, damping, and stiffness matrices. These matrices may be found directly by the user, formed internally by the code from a finite-element model, or formed by a combination of the two methods. SHELL SHOCK is primarily intended for analyzing three-dimensional axisymmetric structures modeled using structural elements generated by the code in which the spatial coordinates are uncoupled by Fourier harmonics. A three-dimensional axisymmetric structure is then reduced to a series of two-dimensional problems, which significantly reduce the computations required. Three types of structural elements (that are uncoupled by a Fourier series) are generated internally by the code: linear beams, shells, and solids of revolution. Nonlinear beam elements under certain conditions can also be uncoupled and are included in the dynamic response computations. Author (NSA)

N75-21681# Boeing Vertol Co., Philadelphia, Pa.
USE OF THE FINITE ELEMENT DAMPED FORCED RESPONSE STRAIN ENERGY DISTRIBUTION FOR VIBRATION REDUCTION Final Report, Jul. 1971 - Jul. 1974
John J. Sciarra Jul. 1974 224 p refs
(Contract DAHC04-71-C-0048)
(AD-A002756; D210-10819-1) Avail: NTIS CSCL 01/3

Analysis has previously been developed verifying that a minimum weight structure with a specified natural frequency is one wherein the density differential (strain energy density less kinetic energy density) is uniform throughout the structure when deformed in its natural mode. Using the convenience of the finite element method, the density differential (or as an approximation, the strain density) of each structural element may be obtained for a given natural mode. This concept is extended here from the modal method to a damped forced response method wherein the strain density is determined for all the structural elements acting under a steady state vibratory loading. Application of energy methods to vibration reduction of the Boeing Vertol Model 347 Tandem Helicopter is shown. Advantages of the damped forced response method as well as other applications are given. GRA

N75-21682# Aerospace Corp., El Segundo, Calif.
THE ORTHOGONALITY CHECK AND THE CORRECTION OF MEASURED MODES Final Report
W. P. Targoff 5 Aug. 1974 20 p refs
(Contract F04701-74-C-0075)
(AD-A001010; TR-R-0075(5901-01)-1; SAMSO-TR-74-240) Avail: NTIS CSCL 20/11

The orthogonality check of the self-compatibility of any set of measured vibration modes is analyzed for information content. It is shown that the effects of symmetric modal couplings predominate in the orthogonality matrix, and that the assumption that such couplings are entirely responsible for the off-diagonal elements in the check leads to simple procedures for their complete elimination. It is further shown that this assumption should produce little adverse effect on the results of calculations using the modes, as corrected by this procedure, for generalized coordinates. GRA

N75-21683# Rome Air Development Center, Griffiss AFB, N.Y.
STRESS ANALYSIS OF A GUYED MAST Final Report
William J. Bochi Oct. 1974 79 p
(AD-A002834; RADC-TR-74-195) Avail: NTIS CSCL 09/5

An 80-ft-high guyed mast supporting a six-ft-diameter parabolic dish antenna was analyzed, using two procedures. The following data was obtained and compared for both procedures: guy wire forces, maximum bending stress in the mast, maximum compressive stress in the mast, and horizontal deflection of the mast at points of guy wire attachment to the mast. The first procedure, a simplified method neglecting bending properties of the mast to obtain guy wire forces, was often used to provide a rapid check of suitability of a tower or mast to perform under given environmental conditions. The second procedure constituted an analysis of the mast as a beam on elastic supports using slope-deflection equations. GRA

N75-21684# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A USER'S MANUAL FOR THE REPSIL CODE Final Report
J. M. Santiago, H. L. Wisniewski, and N. J. Huffington, Jr. Oct. 1974 203 p refs
(DA Proj. 1W1-62118-AD-51; DA Proj. 1T1-61102-A-33E)
(AD-A003176; BRL-1744) Avail: NTIS CSCL 19/4

REPSIL is a finite difference computer program which calculates the large deflection, transient motion of thin Kirchhoff shells. The program marches out the solution by cyclically solving an explicit, centered time difference formula for displacements. The formulation handles elastic-plastic behavior, including strain hardening and strain rate effects, and permits the modeling of a variety of initial shell configurations and impulsive/pressure loadings. The manual gives instructions for correctly setting up problems and estimating machine time and storage requirements. Two illustrative problems are set up and the resulting solutions given. The numerical algorithm employed by REPSIL is outlined and instructions for programming additional initial geometries and loadings are given. The REPSIL plotting program, which produces isometric and cross-sectional displays and time histories of energies, deflections and strains, is also described. Listings of both the REPSIL program and the REPSIL plotting program are included. GRA

N75-21685# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CONCRETE STRENGTH RELATIONSHIPS Final Report
George M. Hammitt, II Dec. 1974 37 p refs
(AD-A003170; AEWES-Misc-Paper-S-74-30) Avail: NTIS CSCL 13/3

This paper presents a summary of five strength tests currently being used to evaluate the load-carrying capability of concrete pavements. The five tests were those for compression, flexure, splitting tensile, ring tensile, and shearing. The strength relationships between these tests reported by 13 sources are presented. A combined analysis was performed on test results from 3640 concrete samples and some relationships were developed. In view of the numerous factors influencing the relationships of the strengths of concrete, it is not surprising that no simple exact relation is applicable. However, these correlations are felt to be representative in lieu of specific testing for concrete pavement design and evaluation. GRA

N75-21686# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLUTION TO THE PROBLEMS OF STRESS CONCENTRATION IN DOUBLY CONNECTED PLATES IN PLASTIC DEFORMATIONS
A. N. Pautov, A. G. Ugodchikov, and I. V. Chepleva 19 Nov. 1974 14 p refs Transl. into ENGLISH from Kontsentratsiya Napryazh. (USSR), no. 3, 1971 p 112-116
(FTD Proj. T74-02-15)
(AD-A003006; FTD-MT-24-2504-74) Avail: NTIS CSCL 20/11

In this work is examined the variation-difference method of solving the first basic two-dimensional problem of the theory of plasticity for doubly-connected regions using curvilinear rectangular co-ordinates. This approach makes it possible to investigate the questions of stress concentration when the curvilinear boundaries of this form are present, and to attain definite advantages in the realization of a solution to the problems on a computer. GRA

N75-21687# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STABILITY OF SHELLS DURING THERMAL SHOCK
N. M. Grigoryants 19 Nov. 1974 11 p refs Transl. into ENGLISH from Soprotivlenie Mater. i Teorii Sooruzhenii (USSR), no. 16, 1972 p 221-224
(AD-A003083; FTD-MT-24-2559-74) Avail: NTIS CSCL 20/11

The stability of a smooth circular cylindrical shell is examined, to whose face heat flux is suddenly supplied. The lateral surface of the shell is ideally heat-insulated. It is assumed that the thermoelastic waves, which are propagated along the generatrix, are compression waves and with the value of the heat flux exceeding its critical value, can cause oscillatory instability of the shell. GRA

N75-21688# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
GENERAL TRANSIENT SOLUTION METHOD FOR THE ENTIRE SUDDEN DEFORMATION DOMAIN OF TWO-DIMENSIONAL SOLIDS Final Report
Moche Ziv Mar. 1974 151 p refs
(Grant AF-AFOSR-2330-72)
(AD-786043; TAE-204; AFOSR-74-1502TR) Avail: NTIS CSCL 20/11

Techniques are presented for ascertaining the multi-dimensional transient deformation of solids. Waves emanate from impulsive sources and their reflections from boundaries map a strong discontinuity region into the solid. The region is comprised of longitudinal, shear, and head waves, all of which are revealed in the solution by this method. The programs which constitute the method are: (1) an analytical formulation which is the dominating base and (2) a numerical integration technique. The analytical part is a kinematical approach and is valid for any

field equations. The dynamical part is constructed of a wave grid and the integration along these paths is carried out numerically using the finite difference method. Author

N75-21689# Texas Univ., Austin. Center for Highway Research.
LINEAR ELASTIC LAYER THEORY AS A MODEL OF DISPLACEMENTS MEASURED WITHIN AND BENEATH FLEXIBLE PAVEMENT STRUCTURES LOADED BY THE DYNAFLECT
Frank H. Scrivner and Chester H. Michalak Aug. 1974 142 p refs Prepared in cooperation with Texas Highway Dept., Austin, and Texas Transportation Inst., College Station
(PB-239244/7; TTI-1-8-69-123-25) Avail: NTIS HC $5.75 CSCL 13B

A presentation is made of the results of an investigation of the capability of linear elastic theory to predict measured displacements on the surface, within, and beneath flexible pavement structures. In measuring predictive capability, the yard stick used was replication error. Sources of data were an NCHRP project, the AASHO Road Test, and the Texas Transportation Institute's Flexible Pavement Test Facility. Only the Texas source, which employed a vibrating surface load (the Dynaflect) and specially designed transducers lowered into small-diameter measurement holes, furnished both horizontal and vertical displacements. These were measured at various depths ranging from zero to 65 inches beneath the pavement surface, and at horizontal distances ranging from 10 to 216 inches. GRA

N75-21690# British Steel Corp., Sheffield (England). Information Services.
THE SELECTION AND FABRICATION OF STEELS FOR OFFSHORE STRUCTURES
J. G. Garland and P. R. Kirkwood Dec. 1974 29 p refs
(PB-238798/3; GS/PROD/MISC/80/74/C) Avail: NTIS HC $3.75 CSCL 13M

The rigorous service conditions and the environmental hazards posed by potential failures have resulted in stringent specifications for both steel plate and welded joints. The significance of general specifications for both plates and welded joints in offshore structures are considered in the context of existing codes of practice and rationalization involving an increase in the severity of material requirements. Steels available to meet specified properties are described together with the implications for forming and post weld heat treatment. Future developments which could lead to significant increases in welding productivity are discussed. GRA

N75-21691# Transport and Road Research Lab., Crowthorne (England).
PROBLEM CLASSIFICATION AND BASIC TECHNIQUES IN ANALYSIS OF INELASTIC STABILITY OF PLATES
L. C. P. Yam 1974 31 p refs
(PB-239165/4; TRRL-LR-657) Avail: NTIS HC $3.75 CSCL 20K

The problem of buckling is categorized into various classes and relevant methods of analysis are proposed. This is done by observing magnitudes of strains measured in recent tests on box girders and stiffened plates. Three classes of problems are recognized: yielding failure, elasto-plastic buckling, and plastic collapse. The first can be analysed by elastic theory using a fiber-yield criterion as a check. For elasto-plastic buckling, since the criteria based on fully plastic section are found to err on the unsafe side, an improved yet simpler criterion (termed the lower yield criterion) is proposed. For the study of plastic collapse, simple formulas based on large strains are derived. GRA

42 GEOSCIENCES (GENERAL)

N75-21692 New Hampshire Univ., Durham.
AN APPROXIMATE SOLUTION TO THE MOVING BOUNDARY PROBLEM ASSOCIATED WITH THE FREEZING AND MELTING OF LAKE ICE Ph.D. Thesis
Stephen Danforth Foss 1974 118 p
Avail: Univ. Microfilms Order No. 75-1655

An approximate solution is developed for the moving boundary problem associated with the freezing and melting of lake ice. The mathematical model developed made use of a quasi-steady state assumption for the ice temperature profile. This assumption eliminated the need to solve the parabolic energy equation describing the heat flow within the ice layer. The validity of this assumption was dependent on two criteria. First, the ambient air temperature must vary slowly with time. Secondly, the Stefan number (defined as the ratio of the driving force for freezing to the resistance to freezing) must be small. The solution obtained by utilizing the assumption was compared with an exact analytical solution obtained by Westphal with simple boundary conditions. From the comparison, a Stefan number range was determined for which reasonable accuracy could be achieved using the approximate solution. Dissert. Abstr.

N75-21693# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 1, 1975
31 Mar. 1975 182 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 1-113
(JPRS-64448) Avail: NTIS HC $7.00

Hydrometeorological aspects of weather forecasting, microclimate and agricultural meteorology are discussed. For individual titles, see N75-21694 through N75-21712.

N75-21694 Joint Publications Research Service, Arlington, Va.
TEMPERATURE FLUCTUATIONS AS A SOURCE OF ENERGY FOR ATMOSPHERIC MOVEMENTS c46
M. I. Yudin, K. V. Pyatygina, E. A. Komorina, and A. Yu. Shtern *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 1-13 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 3-12 (For availability see N75-21693 13-42)

Consideration is given to the ageostrophic wind and vertical velocity induced by temperature fluctuations in the ageostrophic forecasting model for meteorological elements. It is demonstrated that taking these factors into account leads to an increase in the kinetic energy of both the horizonal and vertical movements, thus permitting more correct description of the integral energy relations in the atmosphere. The accuracy of forecasting the air temperature in the lower layer of the atmosphere is improved noticeably by this. Author

N75-21695 Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF METEOROLOGICAL ELEMENTS USING COMPLETE SYSTEMS OF SOLVING PREDICATES AND RECOGNITION GRAPHS c47
A. V. Timofeyev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 14-25 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 13-23 (For availability see N75-21693 13-42)

A method of solving various problems in the classification (recognition, diagnosis, forecasting) of meteorological elements is elaborated based on the structure of the complete systems of logical decision functions involving error free classification of the statistical training sample. It is demonstrated that the complete system of logical decision functions permits representation in the form of a recognition graph -- a decision tree. The proposed approach leads to simple, naturally interpretable algorithms for classification decision making. The effectiveness of the method is illustrated by the experimental results of classifying potential hail and shower clouds. Author

N75-21696 Joint Publications Research Service, Arlington, Va.
FORECASTING THE MONTHLY PRECIPITATION TOTALS FOR EASTERN SIBERIA AND THE FAR EAST DURING THE WARM HALF OF THE YEAR c47
G. V. Svinukhov *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 26-30 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 24-27 (For availability see N75-21693 13-42)

The synoptic-statistical method of forecasting the monthly precipitation totals for the warm half of the year by individual regions of Eastern Siberia and the Far East with a lead time of 4 to 9 months is proposed. The results of testing the procedure

on dependent and independent material are discussed, and a comparison of them with other methods is made. Author

N75-21697 Joint Publications Research Service, Arlington, Va.
STATISTICAL RELATION OF THE VERTICAL TRANSPARENCY OF THE ATMOSPHERE TO THE METEOROLOGICAL PARAMETER c46
Ye. M. Sokolov, L. T. Matveyev, and V. D. Budovyy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 31-41 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 28-35 (For availability see N75-21693 13-42)

The statistical relation between the optical and meteorological characteristics of the atmosphere are studied. The effect of the meteorological visibility on the quality of an aerial photographic survey is analyzed. Author

N75-21698 Joint Publications Research Service, Arlington, Va.
VARIABILITY OF THE ATMOSPHERIC TRANSPARENCY COEFFICIENT c46
G. M. Abakumova, T. V. Yevnevich, and Z. P. Semenova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 42-50 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 36-41 (For availability see N75-21693 13-42)

The time variability of the atmospheric transparency coefficient and its components P sub d and P sub w are studied for an 18 year period according to the data from the meteorological observatory of Moscow State University. The effect of the water vapor content and aerosol content on the atmospheric transparency is investigated. The annual variations of the values of P sub 2, and P sub d and P sub w are presented on the average for the entire observation period. Author

N75-21699 Joint Publications Research Service, Arlington, Va.
CALCULATING THE EFFECT OF VARIOUS FACTORS ON THE EQUILIBRIUM DISTRIBUTION OF OZONE IN THE EARTH'S ATMOSPHERE c46
A. V. Artemyev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 51-58 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 42-47 (For availability see N75-21693 13-42)

Beginning with the numerical solution of the general stationary equation for the meridional ozone distribution, quantitative estimates are made of the effect of the macroturbulence, the water vapor distribution and the photochemical processes, the effect of which is taken into account in various forms, and stated boundary conditions for the ozone profiles obtained for different latitudes. Author

N75-21700 Joint Publications Research Service, Arlington, Va.
DIAGNOSTIC CALCULATIONS OF CURRENTS IN THE TROPICAL ATLANTIC c48
Yu. L. Demin *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 59-71 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 48-57 (For availability see N75-21693 13-42)

The results of calculating the three velocity components of currents in the vicinity of the tropical Atlantic are presented. A study is made of the effect of the nonuniformity of the bottom relief and thickness of the baroclinic layer on the level surface and gradient currents. Author

N75-21701 Joint Publications Research Service, Arlington, Va.
NUMERICAL CALCULATION OF STATIONARY CIRCULATION IN THE BLACK SEA BY TYPICAL WIND FIELDS c48
L. V. Moskalenko *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 72-79 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 58-64 (For availability see N75-21693 13-42)

Numerical calculation of the steady state currents in the Black Sea by the typical wind fields are analyzed. The basis for the model is the method of complete currents for a nonuniform sea of variable depth. The probability of the existence not only of cyclonic but also anticyclonic circulations in the Black Sea is proved. Author

N75-21702 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EULER AND LAGRANGE CHARACTERISTICS OF TURBULENT FLOW AND SOLID PARTICLES MOVING NEAR ITS BOTTOM c34
T. P. Kromskaya and G. S. Fomenko *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 80-86 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 65-69 (For availability see N75-21693 13-42)

The Euler spatial correlation function for the through part of the flow and the Lagrange correlation functions for the alluvium moving near its bottom are presented. In the range of investigated frequencies large scale structural formations are detected twice the depth of the flow in size. The characteristic Lagrange scale defined by the Lagrange correlation functions for alluvium coincides with the mean values of the length of the particle discontinuity. Author

N75-21703 Joint Publications Research Service, Arlington, Va.
HYDRAULIC CONDUCTIVITY OF SOME SOILS OF THE DON-ARCHEDA SAND MASSIF c43
N. A. Muromtsev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 87-93 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 70-75 (For availability see N75-21693 13-42)

By using the sonde method and the method of synchronous moisture profiles and the moisture potential, the hydraulic conductivity coefficient was determined for two different soils with respect to mechanical composition in their moisture range from capillary moisture capacity to maximum hygroscopicity. It is demonstrated that with a reduction in the moisture potential from 0 to -55 atmospheres the hydraulic conductivity coefficient decreased from 1 x 10 to 1 x 10 to the minus 14 power cu cm x sec/q for the chernozem loamy soil and from 6 x 10 to the minus 10 power to 4 x 10 to the minus 15 power cu cm x sec/q. Author

N75-21704 Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF FORECASTING THE GREEN TEA LEAF HARVEST BY THE METHOD OF PARAMETRIC SIMULATION c43
G. A. Arveladze *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 94-105 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 76-84 (For availability see N75-21693 13-42)

A procedure for forecasting the tea leaf harvest was developed on the basis of the specific laws of shoot formation of the tea shrub. The harvest data for individual varieties are considered as a nonstationary discrete time series. In predicting this series it is proposed that the method of parametric simulation be used which was developed by Box and Jenkins. Author

N75-21705 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS OF IDENTIFYING VEGETATION c43
V. I. Rachkulik and M. V. Sitnikova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 106-110 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 85-88 (For availability see N75-21693 13-42)

The effects of soil and green mass on the curves for the spectral brightness coefficients of the soil vegetation system are studied. It is demonstrated that the nature of these curves is determined by the amount of green mass of the vegetation and the reflecting properties of the soil under the plants. Author

N75-21706 Joint Publications Research Service, Arlington, Va.
CLOUDINESS IN THE TROPICAL ZONE OF THE NORTH ATLANTIC (GATE AREA) c47
I. V. Morozova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 111-120 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 89-96 (For availability see N75-21693 13-42)

The form of the correlation between the mean monthly amounts of clouds determined by the satellite data and ground measurements is established. Results are presented from generalizing the data of satellite observations of the amount and form of clouds over the North Atlantic. Author

N75-21707 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL SPECTRA OF THE PREDICTABILITY OF ATMOSPHERIC MOVEMENTS **c46**
M. S. Fuks-Rabinovich *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 121-125 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 97-99 (For availability see N75-21693 13-42)

On the basis of the baroclinic nonadiabatic hemispherical model of the atmosphere used in operative practice, the experimental predictability spectra of the atmospheric movements of different scales are calculated. The role of considering the basic nonadiabatic effects and the variation of the predictability periods is analyzed. Author

N75-21708 Joint Publications Research Service, Arlington, Va.
SOME PECULIARITIES OF THE SPATIAL DISTRIBUTION AND TIME VARIABILITY OF ATMOSPHERIC PRESSURE IN THE EQUATORIAL PART OF THE ANTARCTIC **c46**
R. R. Belevin *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 126-130 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 99-102 (For availability see N75-21693 13-42)

The peculiarities of the transport distribution of the atmospheric pressure in the equatorial part of the Atlantic Ocean at low latitudes clearly express semi-diurnal, diurnal and interdiurnal periodic variability. The average position of the axes of the northern and southern branches of the equatorial depression agrees qualitatively well with the two branches of the thermal equator of the ocean, and the position of the axis of the equatorial pressure ridge with the equatorial region of the low water temperatures. G.G.

N75-21709 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE ORIGIN OF CONDENSATION PROCESSES IN THE ATMOSPHERE BY THE REFLECTED LASER SIGNALS **c46**
A. Ye. Tyabotov, V. I. Shlyakhovi, and A. B. Shupyatskiy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 131-134 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 102-104 (For availability see N75-21693 13-42)

Experimental measurements are presented on the degree of polarization of a laser signal on aerosol particles during the formation and development of a fog. It is demonstrated that for the condensation processes preceding the formation of fog, a change takes place in the polarization of the echo. This effect is noted until the end of the visibility variation. Author

N75-21710 Joint Publications Research Service, Arlington, Va.
ESTIMATING THE STATE OF THE CLEAR SKY BY THE DATA FROM GROUND ACTINOMETRIC OBSERVATIONS **c47**
T. V. Kirillova and R. G. Timanovskaya *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 135-139 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 104-106 (For availability see N75-21693 13-42)

A comparison is made between the data on the statistical structure of the radiation fluxes obtained by a procedure differing from that adopted on the network of meteorological stations and the observation data of the Voyeykovo meteorological station. Author

N75-21711 Joint Publications Research Service, Arlington, Va.
PROBLEM OF OPTIMAL USE OF FORECASTING INFORMATION WHEN MAKING ECONOMIC DECISIONS **c47**
Yu. V. Pokrovskiy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 140-148 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 107-111 (For availability see N75-21693 13-42)

The effectiveness of weather forecasting depends not only on its correctness evaluated by rigid instructions but also the literal in the sense of use of forecasting information by the users to make economic decisions. The forecasts are not error-free; therefore, it is desirable to give them to the users in probability form. The most complete estimate of the correctness of the forecast can be presented in the form of the probability distribution laws of realizing the various values of the hydrometeorological elements when forecasting their specific values. Author

N75-21712 Joint Publications Research Service, Arlington, Va.
NONUNIFORMITY OF THE EARTH'S ROTATION AS THE INTEGRAL CHARACTERISTIC OF THE INTENSITY OF THE PLANETARY ATMOSPHERIC CIRCULATION **c46**
N. S. Sidorenkov *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 149-150 Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 112-113 (For availability see N75-21693 13-42)

On the basis of the law of conservation of momentum the fluctuations in the planetary atmospheric circulation are accompanied by variations in the diurnal rotation rate of the earth. Considering that the effect of other factors is either small or is easily excluded, it is possible to state that the data on the nonuniformity of the earth's rotation can be used as the integral characteristics of the intensity of zonal circulation of the entire atmosphere. Author

N75-21713*# Kanner (Leo) Associates, Redwood City, Calif.
RELATION BETWEEN MOISTURE CONTENT OF SAND AND CRITICAL WIND VELOCITY AT WHICH SAND GRAINS BEGIN TO MOVE
Masuji Akiba Washington NASA Mar. 1975 33 p refs Transl. into ENGLISH from Nogyo Doboku Kenkyu (Japan), v. 5, no. 2, 1933 p 157-174
(Contract NASw-2481)
(NASA-TT-F-16189) Avail: NTIS HC $3.75 CSCL 08M

The relations existing between the critical wind velocity at which sand grains begin to move, and the size, weight, and frictional and adhesive force of the sand grains are given. The following relationships are discussed: a definite correlation between the moisture content of sand and critical wind velocity at which sand grains move, and relations between the moisture content at critical points of sand movement and the force of frictional adhesion and grains. A determination of the practical values of the findings with respect to measures for the prevention of blown sand is made. Author

N75-21714*# Scientific Translation Service, Santa Barbara, Calif.
MOTION OF SAND GRAINS BY WIND
Ryoma Kawamura Washington NASA Mar. 1975 22 p refs Transl. into ENGLISH from Science, v. 18, no. 11, 1948 p 500-506
(Contract NASw-2483)
(NASA-TT-F-16191) Avail: NTIS HC $3.25 CSCL 08M

Results of research on the motion of sand in a wind are presented. Equations for determining the sand 'motion' are derived along with the relationship between wind intensity and amount of moving sand. Author

N75-21715# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SAN DIEGO BAY MODEL STUDY. HYDRAULIC MODEL INVESTIGATION Final Report
George M. Fisackerly Nov. 1974 149 p refs
(AD-A002632; AEWES-TR-H-74-12) Avail: NTIS CSCL 13/2

The San Diego Bay model was a fixed-bed model constructed of concrete to scales of 1:500 horizontally and 1:100 vertically. Approximately 108 square miles of prototype area were reproduced. This area extended from just northeast of Point Loma southward along the coast, including the bay, to just southeast of the southern extremity of South Bay. It extended oceanward to just beyond the -100-ft contour, about 5 miles from Silver Strand, and landward to approximately one mile from the bay. The model was equipped with the necessary appurtenances for the accurate reproduction of tides, tidal currents, and other significant prototype phenomena. The purpose of the study was to determine the effects of a second entrance into the bay on the hydraulic and flushing characteristics of the bay. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-21716 Texas A&M Univ., College Station.
PRODUCTION OF OIL FROM FRACTURED RESERVOIRS BY WATER DISPLACEMENT Ph.D. Thesis
Jon Kleppe 1974 70 p
Avail: Univ. Microfilms Order No. 75-2869

The flow behavior of fractured oil reservoirs produced by water displacement was studied. A two-dimensional numerical model capable of simulating flow of water and oil in the matrix blocks as well as in the fractures was developed. The validity of the model was checked against data from a laboratory experiment involving a matrix-fracture system. Good agreement was observed between the laboratory and simulation results. By means of numerical simulation the effects of production rate and fracture flow capacity on the production history and ultimate oil recovery of a fractured system were evaluated. It is demonstrated that for a given fracture flow capacity, the producing water-oil ratio is a unique function of oil remaining in place and present producing rate. A reservoir can be produced at a high rate until the water-oil ratio becomes too high to handle. Reducing the rate causes the water-oil ratio to decrease to the value it would have had if all the oil had been produced at this lower rate. Dissert. Abstr.

N75-21717 Texas A&M Univ., College Station.
THE DELINEATION OF FLOOD PLAINS USING AUTOMATICALLY PROCESSED MULTISPECTRAL DATA Ph.D. Thesis
George Randall Harker 1974 240 p
Avail: Univ. Microfilms Order No. 75-2858

The application of a remote sensing technique to the determination of flood plain areas is investigated. Optical mechanical multispectral scanner data was simulated utilizing the density differences in a color infrared transparency for a section of the Navasota River. The simulated data was processed utilizing an automatic classification technique previously developed in the remote sensing field. The technique used involves the application of the maximum likelihood rule to categorize the data being processed. An attempt was made to distinguish between areas known to be in the flood plain and those without. A reasonable correlation was found between boundaries based on computer processed multispectral data and those produced by established techniques. Dissert. Abstr.

N75-21718 Kansas Univ., Lawrence.
CLUSTER ANALYSIS AND ITS APPLICATION TO IMAGERY DATA Ph.D. Thesis
Itshak Dinstein 1974 219 p
Avail: Univ. Microfilms Order No. 75-6176

The application of cluster analysis to areas of research involving geosciences, social sciences, and natural sciences is discussed. Cluster analysis enables the researcher to make some generalization about the data, to learn about the structure of the data set and the characteristics of the data elements, and to reduce the dimensionality of the data. Two clustering procedures which are applicable to imagery data are described. The first procedure defines clustering and inverse clustering functions which are iteratively improved. The second procedure takes into account the spatial distribution of the measurement as well as the distribution in measurement space. Specific use of the clustering analysis with ERTS data is reported. Dissert. Abstr.

N75-21719 Stanford Univ., Calif.
INTRUSIONS AND INTRUSIVE COMPLEXES IN THE SAN LUIS OBISPO OPHIOLITE: A CHEMICAL AND PETROLOGIC STUDY Ph.D. Thesis
Jane Ellen Nielson Pike 1974 228 p
Avail: Univ. Microfilms Order No. 75-6903

The San Luis Obispo ophiolite is a sequence of mafic and ultramafic rocks that lie as a thrust-like slice on top of Franciscan melange in the southern California Coast Range. The ophiolite comprises the classic Steinmann Trinity of basal serpentinized ultramafic rocks overlain sequentially by spilitized pillow lavas and cherts. The ophiolite is intruded by numerous diabasic dikes and several large intrusive complexes that contain peridotite, gabbro, diabase and felsic rocks. Field relations indicate that this ophiolite originated as a sequence of submarine volcanic flows and breccia units extruded onto an ultramafic basement. Its metamorphosis and development are discussed in detail. Dissert. Abstr.

N75-21720*# Zurich Univ. (Switzerland). Dept. of Geography.
SNOW SURVEY AND VEGETATION GROWTH IN HIGH MOUNTAINS (SWISS ALPS) AND ADDITIONAL ERTS INVESTIGATIONS IN SWITZERLAND Final Report
Harold Haefner, Principal Investigator [1975] 44 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10195; NASA-CR-142340) Avail: NTIS HC $3.75 CSCL 08F

The author has identified the following significant results. Two different methods, an analog and a digital one, have been developed for rapid and accurate mapping of the areal extent and changes in snow cover in high mountains. The quick-look method is based on individual visual control of each image using a photo quantizer which provides exact references for density slicing with high resolution lith-film. The digital snow classification system is based on discriminant analysis with the data of the four multispectral bands as variables and contains all preprocessing, feature extraction, and mapping steps for an operational application. Two different sets of sampling groups were established which apply to different conditions of snow cover. The first one serves for the normal situation with a uniform dry and new cover. The second one serves for situations with partly thawing and/or frozen snow.

N75-21721*# Alaska Univ., Palmer. Inst. of Agricultural Sciences.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Final Report, Jul. 1972 - May 1974
Jay D. McKendrick, Principal Investigator, Peter C. Scorup, William W. Mitchell, and C. Ivan Branton 26 Jul. 1974 105 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10196; NASA-CR-142375) Avail: NTIS HC $5.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21722*# California Univ., Davis. Dept. of Soils and Plant Nutrition.
USE OF ERTS-1 DATA IN IDENTIFICATION, CLASSIFICATION, AND MAPPING OF SALT-AFFECTED SOILS IN CALIFORNIA Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, Gordon L. Huntington, Principal Investigators, James Thayer, Eugene L. Begg, Fred W. Herbert, Jack K. Clark, William E. Wildman, and Hays Fisher 14 Jul. 1973 18 p Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10197; NASA-CR-142383) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-21723*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING, AND SOIL SALINITY DETECTING Monthly Progress Report, Mar. 1975
Craig L. Wiegand, Principal Investigator Apr. 1975 5 p EREP (NASA Order T-4105-B)
(E75-10198; NASA-CR-142384; MPR-15) Avail: NTIS

HC $3.25 CSCL 02C
There are no author-identified significant results in this report.

N75-21724*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Mar. - 31 Mar. 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 14 Apr. 1975 13 p refs EREP
(Contract NAS9-13276)
(E75-10199; NASA-CR-142385; PR-21) Avail: NTIS HC $3.25 CSCL 08E
There are no author-identified significant results in this report.

N75-21725*# Institut Francais du Petrole, Rueil-Malmaison.
STUDY OF POLLUTION AT SEA Final Report, Sep. 1972 - May 1974
A. Fontanel, Principal Investigator May 1974 33 p Presented at the Symp. on Significant Results, Greenbelt, Md., 5-9 Mar. 1973 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10200; NASA-CR-142386) Avail: NTIS HC $3.75 CSCL 08J
There are no author-identified significant results in this report.

N75-21726*# Environmental Research Inst. of Michigan, Ann Arbor.
DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA Quarterly Progress Report, Nov. 1974 - Feb. 1975
Robert E. Turner, Principal Investigator 2 Apr. 1975 2 p EREP
(Contract NAS9-13279)
(E75-10201; NASA-CR-142387; ERIM-102200-16-L) Avail: NTIS HC $3.25 CSCL 03B
There are no author-identified significant results in this report.

N75-21727*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1 Mar. - 31 Mar. 1975
K. J. Savastano, Principal Investigator 31 Mar. 1975 3 p EREP
(NASA Order T-8217-B)
(E75-10202; NASA-CR-142388; PR-15) Avail: NTIS HC $3.25 CSCL 08A
There are no author-identified significant results in this report.

N75-21728*# Geological Survey, Reston, Va.
THE UTILIZATION OF ERTS-1 GENERATED IMAGES IN THE EVALUATION OF SOME IRANIAN PLAYAS AS SITES FOR ECONOMIC AND ENGINEERING DEVELOPMENT, PART 1 Final Report, 1 Jul. 1972 - 28 Feb. 1974
Daniel B. Krinsley, Principal Investigator 30 Apr. 1974 48 p refs ERTS
(NASA Order S-70243-AG)
(E75-10203; NASA-CR-142389) Avail: NTIS HC $3.75 CSCL 08H
There are no author-identified significant results in this report.

N75-21729*# Geological Survey, Reston, Va.
THE UTILIZATION OF ERTS-1 GENERATED IMAGES IN THE EVALUATION OF SOME IRANIAN PLAYAS AS SITES FOR ECONOMIC AND ENGINEERING DEVELOPMENT, PART 2 Final Report, 1 Jul. 1972 - 28 Feb. 1974
Daniel B. Krinsley, Principal Investigator 30 Apr. 1974 54 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10204; NASA-CR-142390) Avail: NTIS HC $4.25 CSCL 08H
There are no author-identified significant results in this report.

N75-21730*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL RESOLUTION IN PHOTOGRAPHIC FORM Final Report
P. N. Slater, Principal Investigator and R. A. Schowengerdt Jan. 1975 93 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21849)
(E75-10205; NASA-CR-142391) Avail: NTIS HC $4.75 CSCL 05B
The author has identified the following significant results. The digital Optical Transfer Function (OTF) measurements showed the following: (1) there are no significant differences in optical performance, in terms of OTF, among all four bands of the multispectral scanner, (2) no substantial changes in the OTF's of bands 4, 5, and 6 during the period November 1972 to May 1973, and (3) comparison between the photographic and digital (CCT) two-dimensional OTF's indicated a strong asymmetry in the photographic product OTF between the MSS scan direction and across scan direction. The coherent light Fourier analysis program showed the following: (1) for agricultural areas, bands 5 and 7 of the MSS are superior in terms of image definition, and therefore mapping and acreage estimation, (2) amplitude modulation in imagery from MSS bands 4 and 5 is between 65 to 90 percent of that in corresponding bands of Apollo 9 imagery (SO65), and (3) MSS band 5 imagery has a ground resolution between 55 to 75 percent of that exhibited in the corresponding band of Apollo 9 imagery (SO65).

N75-21731*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
GEOLOGIC ANALYSIS OF ERTS-1 IMAGERY FOR THE STATE OF NEW MEXICO Final Report, Aug. 1972 - Mar. 1974
Frank E. Kottlowski, Principal Investigator, Sandra Feldman, Michael Inglis, Karl VonderLinden, Charles E. Chapin, and Rodney C. Rhodes Aug. 1974 105 p refs Prepared in cooperation with New Mexico Univ., Albuquerque Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21861)
(E75-10206; NASA-CR-142392) Avail: NTIS HC $5.25 CSCL 08G
There are no author-identified significant results in this report.

N75-21732*# Texas Technological Univ., Lubbock.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS Final Report
C. C. Reeves, Jr., Principal Investigator 31 Aug. 1974 151 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21720)
(E75-10207; NASA-CR-142393) Avail: NTIS HC $6.25 CSCL 08H
There are no author-identified significant results in this report.

N75-21733*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES Final Report, Sep. 1972 - Nov. 1974
Robert H. Rogers and V. Elliott Smith, Principal Investigators (Cranbrook Inst. of Science) Nov. 1974 124 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21810)
(E75-10208; NASA-CR-142394) Avail: NTIS HC $5.25 CSCL 08H
There are no author-identified significant results in this report.

N75-21734*# Minnesota State Planning Agency, St. Paul.
APPLICATION OF ERTS-1 IMAGERY TO STATE WIDE LAND INFORMATION SYSTEM IN MINNESOTA Final Report, 1 Jul. 1972 - 31 Dec. 1974
Joseph E. Sizer, John R. Borchert, Principal Investigators, Dwight A. Brown, Merle P. Meyer, Richard Rust, Richard H. Skaggs, Deborah Pile, John M. Smiley, and Eliahu Stern 16 Jan. 1975 88 p refs Prepared in cooperation with Minnesota Univ., Minneapolis ERTS
(Contract NAS5-21801)
(E75-10209; NASA-CR-142395) Avail: NTIS HC $4.75 CSCL 08B

There are no author-identified significant results in this report.

N75-21735*# Mississippi State Univ., State College. Inst. for Environmental Studies.
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Final Report, Oct. 1972 - Sep. 1974
C. W. Bouchillon, Principal Investigator, F. M. Ingels, R. W. Boyd, G. Tupper, C. Baskin, and J. Therral 20 Dec. 1974 78 p refs ERTS
(Contract NAS5-21881)
(E75-10210; NASA-CR-142396) Avail: NTIS HC $4.75 CSCL 02C

There are no author-identified significant results in this report.

N75-21736*# Alaska Univ., Fairbanks. Geophysical Inst.
FEASIBILITY STUDY FOR LOCATING ARCHAEOLOGICAL VILLAGE SITES BY SATELLITE REMOTE SENSING TECHNIQUES Final Report, Jul. 1972 - Jan. 1974
J. P. Cook, Principal Investigator and W. J. Stringer 17 Oct. 1974 75 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10211; NASA-CR-142397) Avail: NTIS HC $4.25 CSCL 08B

There are no author-identified significant results in this report.

N75-21737*# Wolf Research and Development Corp., Riverdale, Md.
THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA Final Report, May 1972 - Sep. 1974
Allan J. Jelacic, Principal Investigator Oct. 1974 212 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21761)
(E75-10212; NASA-CR-142398) Avail: NTIS HC $7.25 CSCL 04A

There are no author-identified significant results in this report.

N75-21738*# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
COMPARISON OF ERTS-1 AND SLAR DATA FOR THE STUDY OF SURFACE WATER RESOURCES Final Report, 1 Jul. 1972 - 30 Aug. 1974
M. Leonard Bryan, Principal Investigator Jan. 1975 102 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10213; NASA-CR-142399; ERIM-193300-59-F) Avail: NTIS HC $5.25 CSCL 08H

There are no author-identified significant results in this report.

N75-21739*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
WATER QUALITY MONITORING USING ERTS-1 DATA Final Report, Jun. 1972 - Aug. 1974
C. T. Wezernak, Principal Investigator Mar. 1975 85 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10214; NASA-CR-142400) Avail: NTIS HC $4.75 CSCL 08H

There are no author-identified significant results in this report.

N75-21740*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MAPPING OF THE MAJOR STRUCTURES OF THE AFRICAN RIFT SYSTEM Final Report
Paul A. Mohr, Principal Investigator Jul. 1974 88 p refs ERTS
(Contract NAS5-21748)
(E75-10215; NASA-CR-142401) Avail: NTIS HC $4.75 CSCL 08B

There are no author-identified significant results in this report.

N75-21741*# California Univ., Santa Barbara. Dept. of Geography.
USE OF ERTS-1 DATA TO ACCESS AND MONITOR CHANGE IN THE WEST SIDE OF THE SAN JOAQUIN VALLEY AND CENTRAL COASTAL ZONE OF CALIFORNIA Final Report, Jul. 1972 - Jul. 1973
Robert N. Colwell, John E. Estes, Principal Investigators, L W. Senger, R. R. Thaman, D. Brunelle, D. Cottrell, F. Evanisko, S. P. Kraus, B. Palmer, J. M. Ryerson et al Jul. 1973 70 p Orginal contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10216; NASA-CR-142402) Avail: NTIS HC $4.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21742*# California Univ., Riverside. Dept. of Geography.
USE OF ERTS-1 DATA TO ASSESS AND MONITOR CHANGE IN THE SOUTHERN CALIFORNIA ENVIRONMENT Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, Leonard W. Bowden, Principal Investigators, J. Viellenave, C. Johnson, J. Bale, J. Huning, R. Pease, R. Petersen, R. Minnich, A. Sullivan et al 14 Jul. 1973 84 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10217; NASA-CR-142403) Avail: NTIS HC $4.75 CSCL 04A

There are no author-identified significant results in this report.

N75-21743*# California Univ., Davis. Dept. of Soils and Plant Nutrition.
USE OF ERTS-1 DATA IN THE EDUCATIONAL AND APPLIED RESEARCH PROGRAMS OF AGRICULTURAL EXTENSION Final Report, 15 Jul. 1972 - 15 Jul. 1973
Robert N. Colwell, William E. Wildman, Principal Investigators, Jack Clark, Hays Fisher, Richard Pelton, and James Thayer 14 Jul. 1973 24 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E75-10218; NASA-CR-142404) Avail: NTIS HC $3.25 CSCL 02C

There are no author-identified significant results in this report.

N75-21744*# Alaska Univ., Fairbanks. Geophysical Inst.
GLACIOLOGICAL AND VOLCANOLOGICAL STUDIES IN THE WRANGELL MOUNTAINS, ALASKA Final Report, Jul. 1972 - Sep. 1974

Carl S. Benson, Principal Investigator and Lewis H. Shapiro 20 Sep. 1974 58 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E75-10219; NASA-CR-142405) Avail: NTIS HC $4.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21745*# Oceanographic Services, Inc., Santa Barbara, Calif.
CORRELATION OF OCEAN TRUTH DATA WITH ERTS-1 IMAGERY: CALIFORNIA COASTAL SITES IN MONTEREY BAY, SANTA BARBARA CHANNEL, AND SANTA MONICA BAY Final Report
William A. Anikouchine, Principal Investigator Oct. 1974 396 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21877)
(E75-10220; NASA-CR-142406) Avail: NTIS HC $10.25 CSCL 08J

There are no author-identified significant results in this report.

N75-21746*# Nevada Univ., Reno. Mackay School of Mines.
[ANALYSIS OF AERIAL PHOTOGRAPHY AND MULTISPECTRAL DATA FOR CARTOGRAPHY AND GEOMORPHOLOGY OF NEVADA] Final Report
Joseph Lintz, Jr., Principal Investigator 29 Sep. 1973 15 p ERTS
(Contract NAS5-21864)
(E75-10221; NASA-CR-142407) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-21747*# Nuclear Research Center, Athens (Greece).
APPLICATION OF ERTS-1 IMAGERY TO LAND USE, FOREST DENSITY AND SOIL INVESTIGATIONS Final Report
Nicholas J. Yassoglou, Principal Investigator 26 Apr. 1974 32 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10222; NASA-CR-142408) Avail: NTIS HC $3.75 CSCL 02F

There are no author-identified significant results in this report.

N75-21748*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 1 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 390 p ERTS
(Contract NAS5-21876)
(E75-10223; NASA-CR-142411) Avail: NTIS HC $10.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21749*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 2 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 596 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21876)
(E75-10224; NASA-CR-142410) Avail: NTIS HC $13.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21750*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A, VOLUME 3 Final Report
Harold R. Henry, Principal Investigator Aug. 1974 641 p refs ERTS
(Contract NAS5-21876)
(E75-10225; NASA-CR-142409) Avail: NTIS HC $15.25 CSCL 08F

There are no author-identified significant results in this report.

N75-21751*# Aerospace Corp., Los Angeles, Calif. Space Physics Lab.
STUDY TO DEMONSTRATE THE FEASIBILITY OF AND DETERMINE THE OPTIMUM METHOD FOR REMOTE HAZE MONITORING BY SATELLITE Final Report
Ernest H. Rogers, Principal Investigator, D. F. Nelson, and C. M. Randall Dec. 1974 103 p refs Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21719)
(E75-10226; NASA-CR-142412) Avail: NTIS HC $5.25 CSCL 04B

There are no author-identified significant results in this report.

N75-21752*# Ohio Dept. of Economic and Community Development, Columbus.
THE RELEVANCE OF ERTS-1 DATA TO THE STATE OF OHIO Final Report, Jul. 1972 - Oct. 1974
David C. Sweet, P. G. Pincura, G. E. Wukelic, Principal Investigators (Battelle Columbus Labs., Ohio), C. J. Meier (Ohio Dept. of Natural Resources), T. L. Wells (Ohio Dept. of Natural Resources), L. O. Herd (Ohio Dept. of Transportation), G. B. Garrett (Ohio Environmental Protection Agency), B. G. Stamm, J. M. Dowdy (Ohio State Univ.), J. G. Stephan (Battelle Columbus Labs., Ohio) et al 10 Oct. 1974 150 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21782)
(E75-10227; NASA-CR-142413) Avail: NTIS HC $5.75 CSCL 08F

There are no author-identified significant results in this report.

N75-21753*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
GEOLOGICAL INVESTIGATION USING ERTS ORBITAL IMAGES IN THE PORTUGAL REPUBLIC AND WESTERN SPAIN Final Report, Jul. 1972 - Apr. 1974
Guy Weecksteen, Principal Investigator and J. Y. Scanvic Apr. 1974 40 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10228; NASA-CR-142414) Avail: NTIS HC $3.75 CSCL 08G

There are no author-identified significant results in this report.

N75-21754*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENTS WITH ERTS-1 Final Report, May 1972 - Aug. 1974
George A. Maul, Principal Investigator Aug. 1974 84 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E75-10229; NASA-CR-142415) Avail: NTIS HC $4.75 CSCL 08C

There are no author-identified significant results in this report.

N75-21755*# Bureau of Indian Affairs, Washington, D.C.
TIMBER RESOURCES INFORMATION SYSTEM Final Report, 30 Jun. 1972 - 23 Mar. 1974
Arthur M. Woll, Principal Investigator 19 Jun. 1974 76 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG)
(E75-10230; NASA-CR-142416) Avail: NTIS HC $4.75 CSCL 02F

There are no author-identified significant results in this report.

N75-21756*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Jan. - 15 Mar. 1975
Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 Mar. 1975 8 p
(NASA Order T-4106-B)
(E75-10231; NASA-CR-142417; BMPR-16) Avail: NTIS HC $3.25 CSCL 02F

There are no author-identified significant results in this report.

N75-21757*# Helsinki Univ. (Finland). Dept. of Geophysics.
ON THE POSSIBILITIES OF DETERMINING THE BASIN CHARACTERISTICS BY MEANS OF SATELLITE IMAGES Final Report
Erkki Palosuo and Risto Kuittinen, Principal Investigators (National Board of Waters, Helsinki, Finland) 7 Jan. 1974 25 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10232; NASA-CR-142418) Avail: NTIS HC $3.25 CSCL 08E

There are no author-identified significant results in this report.

N75-21758*# Polytechnical Univ. of Madrid (Spain). Escuala Tecnica Superior de Ingenieros Agronomos.
IDENTIFICATION OF LARGE MASSES OF CITRUS FRUIT AND RICE FIELDS IN EASTERN SPAIN
Fernando de Sagredo Lopez, Principal Investigator 1974 6 p Sponsored by NASA ERTS
(E75-10233; NASA-CR-142419) Avail: NTIS HC $3.25 CSCL 02C

There are no author-identified significant results in this report.

N75-21759*# Forest Research Inst., Helsinki (Finland).
DEMONSTRATION OF THE APPLICABILITY OF SATELLITE DATA TO FORESTRY Final Report, Dec. 1972 - Apr. 1974
Kullervo Kuusela, Principal Investigator Apr. 1974 31 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10234; NASA-CR-142420) Avail: NTIS HC $3.75 CSCL 20F

There are no author-identified significant results in this report.

N75-21760*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Final Report, 19 Jun. 1972 - 27 Nov. 1974
Craig L. Wiegand, Principal Investigator, H. W. Gausman, R. W. Leamer, A. J. Richardson, A. H. Gerbermann, R. J. Torline, M. R. Gautreaux, J. H. Everitt, J. A. Guellar, R. R. Rodriguez et al Nov. 1974 89 p refs Original contains color illustrations ERTS
(NASA Order S-70251-AG)
(E75-10235; NASA-CR-142423) Avail: NTIS HC $4.75 CSCL 20F

The author has identified the following significant results. Bands 4, 5, and 7 and 5, 6, and 7 were best for distinguishing among crop and soil categories in ERTS-1 SCENES 1182-16322 (1-21-73) and 1308-16323 (5-21-73) respectively. Chlorotic sorghum areas 2.8 acres or larger in size were identified on a computer printout of band 5 data. Reflectance of crop residues was more often different from bare soil in band 4 than in bands 5, 6, and 7. Simultaneously acquired aircraft and spacecraft MSS data indicated that spacecraft surveys are as reliable as aircraft surveys. ERTS-1 data were successfully used to estimate acreage of citrus, cotton, and sorghum as well as idle crop land.

N75-21761*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
GEOLOGICAL STUDY OF THE SOUTHERN PART OF THE MALAGASY REPUBLIC USING ERTS ORBITAL IMAGES Final Report, Oct. 1973 - Mar. 1974
Guy Weecksteen, Principal Investigator, J. Y. Scanvic, and B. Koch Mar. 1974 46 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10236; NASA-CR-142424) Avail: NTIS HC $4.75 CSCL 08G

The author has identified the following significant results. The Malagasy stratigraphy and tectonic are very complex, but the results obtained using ERTS-1 images interpretation make credible some hypothesis recently proposed by geologists. Most of known fractures are identified and numerous new observations are made on these images in the field of linear fractures. Some of them extend or relay known fractures and many others are totally new even if scattered field observations make it possible to assume that they correspond to reality. In the domain of lithology different types of rocks are distinguished, but the results are better in sedimentary formations than in the basement.

N75-21762*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
STRUCTURAL GEOLOGY INVESTIGATION IN THE REPUBLICS OF DAHOMEY AND TOGOLAND, AFRICA, USING ERTS-1 MULTI-SPECTRAL IMAGES Final Report, Jul. 1973 - Apr. 1974
Guy Weecksteen, Principal Investigator Apr. 1974 22 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10237; NASA-CR-142425) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Recent geological studies in the Republics of Dahomey and Togoland put in light a new chronology and propose a schema indicating that the structural geology of this region is very complicated. The new observations made possible by the ERTS images concern the main orientations, the folded units, and the lithology. The correlation between different types of laterite and the petrology of the basement seems possible, and is the most significant result of this investigation but unfortunately conducted with poor quality images because of atmospheric haze.

N75-21763*# National Environmental Satellite Service, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Jan. - Mar. 1975
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Mar. 1975 6 p EREP
(NASA Order T-4715-B)
(E75-10238; NASA-CR-142426; QPR-8) Avail: NTIS HC $3.25 CSCL 04B

There are no author-identified significant results in this report.

N75-21764*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Mar. 1975
Paul M. Merifield, Principal Investigator 5 Apr. 1975 2 p EREP

(Contract NAS2-7698)
(E75-10239; NASA-CR-142532; MPR-22) Avail: NTIS HC $3.25 CSCL 08E

There are no author-identified significant results in this report.

N75-21765*# Bureau of Reclamation, Denver, Colo.
USE OF ERTS-1 SATELLITE DATA COLLECTION SYSTEM IN MONITORING WEATHER CONDITIONS FOR CONTROL OF CLOUD SEEDING OPERATIONS Final Report, Sep. 1972 - 30 Jun. 1974
Archie M. Kahan, Principal Investigator Jul. 1974 107 p refs ERTS
(NASA Order S-70243-AG)
(E75-10240; NASA-CR-142533) Avail: NTIS HC $5.25 CSCL 04B

There are no author-identified significant results in this report.

N75-21766*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Mar. - 31 Mar. 1975
Monem AbdelGawad, Principal Investigator 14 Apr. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10241; NASA-CR-142534) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. The fault pattern in the southern Nevada tectonic intersection and adjacent Mojave block was found to be consistent with a model partly suggested by Hamilton and Myers (1966). The model has the following basic elements: (1) a major Laramide left-lateral shear on the Texas Zone, (2) counterclockwise rotation of the Sierra Nevada-Klamath Mountain block, (3) clockwise rotation of the Colorado Plateau, and (4) crustal extension and intrusion of volcanics in Nevada.

N75-21767*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSIS UTILIZING ERTS-1 IMAGERY Final Report, Jun. 1972 - Feb. 1974
Duwayne M. Anderson, Principal Investigator, Harlan L. McKim, Lawrence W. Gatto, Richard K. Haugen, William K. Crowder, Charles W. Slaughter, and Thomas L. Marlar 26 Feb. 1974 128 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70253-AG)
(E75-10245; NASA-CR-142538) Avail: NTIS HC $5.75 CSCL 08L

The author has identified the following significant results. ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. Physical boundaries mapped from ERTS-1 imagery in combination with ground truth obtained from existing small scale maps and other sources resulted in improved and more detailed maps of permafrost terrain and vegetation for the same area. Snowpack cover within a research watershed has been analyzed and compared to ground data. Large river icings along the proposed Alaska pipeline route from Prudhoe Bay to the Brooks Range have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska have been measured during a four day period in March and shore-fast ice accumulation and ablation along the west coast of Alaska have been mapped for the spring and early summer seasons.

N75-21768*# Consejo de Recursos Naturales no Renovables, Mexico City.
TO MAKE A LAND USE INVENTORY AND ITS CHANGE WITH TIME AND DEVELOPMENT. TO INVESTIGATE HOW THIS AREA IN THE SEMI-ARID CLIMATE IS DEVELOPING, AND THE ECOLOGICAL IMPACT WITH THE CONSTRUCTION OF SEVERAL GOVERNMENT PROJECTS IN CENTRAL MEXICO Final Report, May - Sep. 1974
Carlos AcoustaDelCampo, Principal Investigator Oct. 1974 32 p Sponsored by NASA Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10246; NASA-CR-142539) Avail: NTIS HC $3.75 CSCL 08B

The author has identified the following significant results. Comparison between ERTS-1 image scale 1:1,000,000 and CETENAL's charts scale 1:50,000 in irrigated land surface determination in one selected spot gave the following results: Surface on CETENAL's charts 129,900 Has. and arbitrarily we gave 100 percent to this value. Surface on image 122,400 Has., 94.5 percent of the first value. It is necessary to use all four bands to have optimum results on the interpretation. The Principal Investigator made use of photointerpretation techniques only, mostly monoscopically.

N75-21769*# National Ocean Survey, Rockville, Md.
SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 15 Jan. - 15 Apr. 1975
Morton Keller, Principal Investigator 15 Apr. 1975 2 p EREP
(NASA Order T-4110-B)
(E75-10247; NASA-CR-142540) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-21770*# Agricultural Research Service, Chickasha, Okla.
INVESTIGATION OF USE OF SPACE DATA IN WATERSHED HYDROLOGY Final Report, 1 Jul. 1972 - 1 Jul. 1974
Bruce J. Blanchard, Principal Investigator 25 Jan. 1975 127 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70251-AG)
(E75-10248; NASA-CR-142541) Avail: NTIS HC $5.75 CSCL 08H

The author has identified the following significant results. Digital data from the ERTS multispectral scanner were used to investigate the feasibility of identifying differences in watershed runoff capability with spaceborne sensors. Linear combinations of the two visible light bands and a combination of the four visible and near infrared bands were related to a coefficient used in the Soil Conservation Service storm runoff equation. Good relationships were found in two scenes, both with dry surface conditions, over the same watersheds. The relationships defined by both combinations of digital data were tested on a independent set of 10 watersheds and on an additional 22 subwatersheds. Coefficients predicted with the ERTS data proved better than coefficients developed with conventional methods.

N75-21771*# National Environmental Satellite Service, Suitland, Md.
EVALUATION OF ERTS-1 DATA FOR CERTAIN HYDROLOGICAL USES Final Report, Jul. 1972 - Nov. 1974
Donald R. Wiesnet, Principal Investigator, David F. McGinnis, and Michael C. McMillan 30 Nov. 1974 94 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG)
(E75-10249; NASA-CR-142542) Avail: NTIS HC $4.75 CSCL 08H

The author has identified the following significant results. ERTS-1 MSS data have been used in a variety of hydrologic research including snow-extent mapping; studies of snowmelt, snowmelt runoff, spectral reflectance of snow for assessing snowpack conditions, and snow albedo; lake ice formation, breakup, and migration; lake current measurements; multispectral studies of lake ice; and flood studies. MSS sensing of soil moisture over a well-vegetated test site was unsuccessfully attempted. Although a powerful research tool, ERTS-1 has very limited use

as an operational system for hydrologic communities because of its 18-day revisit cycle and its lack of a quick look capability.

N75-21772*# Louisiana State Univ., Baton Rouge. Dept. of Mechanical, Aerospace and Industrial Engineering.
INVESTIGATION OF LAND-USE SPECTRAL SIGNATURES Ph.D. Thesis. Final Report
John F. Hagewood Mar. 1975 378 p refs
(Contract NAS8-30620)
(NASA-CR-120724) Avail: NTIS HC $10.25 CSCL 20F

A technique was developed to obtain bidirectional reflectance data from natural surfaces by using a folding mirror to transfer the reflected energy from the test surface to a spectroradiometer. The folding mirror was a first surface reflector made by stretching Mylar vacuum coated with aluminum over a light weight frame. The optically folding mirror was positioned over the test surfaces with a moveable platform for both laboratory and field tests. Field tests were conducted using a tethered balloon system to position the folding mirror. A spectroradiometer was designed and built specifically for this investigation. The spectroradiometer had an angular field of view of twenty-four minutes in one axis and ten minutes in the other axis. The radiometer was capable of detecting energies in small bandwidths throughout the electromagnetic spectrum from 0.3 microns to 3.0 microns. Bidirectional reflectance data and variations in the data with source angles were obtained for Saint Augustine grass, Bermuda grass, and a black alluvium soil from the Mississippi River Delta. Author

N75-21773*# Alaska Univ., Fairbanks.
APPLICATION OF REMOTE SENSING DATA TO SURVEYS OF THE ALASKAN ENVIRONMENT Annual Report, 1 Jul. 1973 - 30 Jun. 1974
A. E. Belon and J. M. Miller 30 Jun. 1974 141 p refs
(Grant NGL-02-001-092)
(NASA-CR-142519) Avail: NTIS HC $5.75 CSCL 08F

Coupling of satellite data to resource management problems in Alaska is implemented through feasibility studies of applicability of Landsat data to specific environmental surveys in ecology, agriculture, hydrology, wildlife management, oceanography, geology, etc.; and using the results of these studies to extend the benefits of satellite data applications to the operational needs of mission-oriented agencies of Federal, state, and regional governments, as well as private industry. Activities designed to encourage the participation of users in the Landsat program at levels most appropriate to the users' interests are described and include: observation, coordination, and information exchange; training courses and workshops; data exchange; consulting services; data processing services; user participation in University research projects; and university participation in the operational projects of user agencies. Progress in these areas is reported. The effectiveness of this broad-based approach in overcoming the initial apprehensiveness of users is demonstrated. J.M.S.

N75-21774*# State Univ. of New York Research Foundation, Albany.
REMOTE SENSING: AN INVENTORY OF EARTH'S RESOURCES
Nicholas Gramenopoulos [1974] 37 p
(Contract NASw-2508)
(NASA-CR-142614) Avail: NTIS HC $3.75 CSCL 08G

The remote sensing capabilities of Landsat are reviewed along with the broad areas of application of the Landsat imagery. The importance of Landsat imagery in urban planning and resources management is stressed. J.M.S.

N75-21775*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE EMISSION FROM SNOW AND GLACIER ICE
T. C. Chang, P. Gloersen, T. Schmugge, T. T. Wilheit, and H. J. Zwally Feb. 1975 31 p refs Submitted for publication
(NASA-TM-X-70871; X-910-75-36) Avail: NTIS HC $3.75 CSCL 08L

The microwave brightness temperature for snow fields was studied assuming that the snow cover consists of closely packed scattering spheres which do not interact coherently. The Mie scattering theory was used to compute the volume scattering albedo. It is shown that in the wavelength range from 0.8 to 2.8 cm, most of the micro-radiation emanates from a layer 10 meters or less in thickness. It is concluded that it is possible to determine snow accumulation rates as well as near-surface temperature. F.O.S.

N75-21776*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
SUMMARY OF SKYLAB S-193 ALTIMETER ALTITUDE RESULTS
J. T. McGoogan, C. D. Leitao, and W. T. Wells (Wolf Research and Development Corp., Riverdale, Md.) Feb. 1975 324 p refs
(NASA-TM-X-69355) Avail: NTIS HC $9.25 CSCL 05B

The SKYLAB S-193 altimeter altitude results are presented in a concise format for further use and analysis by the scientific community. The altimeter mission and instrumentation is described along with the altimeter processing techniques and values of parameters used for processing. The determination of reference orbits is discussed, and the tracking systems utilized are tabulated. Techniques for determining satellite pointing are presented and a tabulation of pointing for each data mission included. The geographical location, the ocean bottom topography, the altimeter-determined ocean surface topography, and the altimeter automatic gain control history is presented. Some typical applications of this data are suggested. Author

N75-21777*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ERTS-1 INVESTIGATION (ER-600): A COMPENDIUM OF ANALYSIS RESULTS OF THE UTILITY OF ERTS-1 DATA FOR LAND RESOURCES MANAGEMENT
R. Bryan Erb Nov. 1974 170 p Original contains color illustrations
(NASA-TM-X-58156; JSC-08455) Avail: NTIS HC $6.25 CSCL 08F

The results of the ERTS-1 investigations conducted by the Earth Observations Division at the NASA Lyndon B. Johnson Space Center are summarized in this report, which is an overview of documents detailing individual investigations. Conventional image interpretation and computer-aided classification procedures were the two basic techniques used in analyzing the data for detecting, identifying, locating, and measuring surface features related to earth resources. Data from the ERTS-1 multispectral scanner system were useful for all applications studied, which included agriculture, coastal and estuarine analysis, forestry, range, land use and urban land use, and signature extension. Percentage classification accuracies are cited for the conventional and computer-aided techniques. Author

N75-21778*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ERTS-1 INVESTIGATION (ER-600). VOLUME 1: ERTS-1 AGRICULTURAL ANALYSIS Progress Report, Jul. 1972 - Jun. 1973
R. Bryan Erb Nov. 1974 209 p Original contains color illustrations 7 Vol.
(NASA-TM-X-58117; JSC-08456-Vol-1) Avail: NTIS HC $7.25 CSCL 02C

The Agriculture Analysis Team of the Johnson Space Center conducted a 1-year-long investigation of ERTS-1 multispectral data to evaluate how well features of agricultural importance could be detected, identified, and located; and their areal extent measured. Six study areas were selected in cooperation with the U.S. Department of Agriculture. Two basic analytical approaches were used to meet the objectives. The conventional image interpretation technique revealed that a particular color was an indication of the density of vegetative cover, not an indication of crop classification. Computer-aided techniques were used to classify crop types (i.e., small grains, truck farm crops, grasses, summer fallow) to accuracies as high as 95 percent on large (12 hectares or more) well-defined fields. A further breakdown into crop species (wheat, barley, soybeans, oats, corn) reduced the accuracy to 70 to 80 percent for single-date observations. Author

N75-21779*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE ERTS-1 INVESTIGATION (ER-600). VOLUME 5: ERTS-1 URBAN LAND USE ANALYSIS Report, Jul. 1972 - Jun. 1973
R. Bryan Erb Oct. 1974 121 p refs Original contains color illustrations
(NASA-TM-X-58121; JSC-08460) Avail: NTIS HC $5.75 CSCL 08B

The Urban Land Use Team conducted a year's investigation of ERTS-1 MSS data to determine the number of Land Use categories in the Houston, Texas, area. They discovered unusually low classification accuracies occurred when a spectrally complex urban scene was classified with extensive rural areas containing spectrally homogeneous features. Separate computer processing of only data in the urbanized area increased classification accuracies of certain urban land use categories. Even so, accuracies of urban landscape were in the 40-70 percent range compared to 70-90 percent for the land use categories containing more homogeneous features (agriculture, forest, water, etc.) in the nonurban areas. Author

N75-21780# California Earth Science Corp., Santa Monica.
ENHANCEMENT OF GEOLOGIC FEATURES NEAR MOJAVE, CALIFORNIA BY SPECTRAL BAND RATIOING OF ERTS MSS DATA
P. M. Merifield, D. L. Lamar, J. R. Keaton (Calif. Univ., Los Angeles), and J. V. Lamar (RAND Corp., Santa Monica, Calif.) Dec. 1974 21 p refs
(Contract DI-14-08-0001-13911)
(TR-74-4) Avail: NTIS HC $3.25

Spectral band ratioing of ERTS multispectral scanner subsystem (MSS) data was performed as a portion of a broader investigation to apply ERTS imagery to the analysis of fault tectonics and earthquake hazards of southern California. A number of geologic features in the western Mojave Desert were enhanced in spectral ratio images of ERTS MSS data, especially in the Band 5 to Band 4 ratio. Alluvial fans of different ages, which are indistinguishable in single spectral band images, are readily differentiated. Subtle differences in soil color are apparently enhanced on the ratio images, and differences in the density and type of vegetation may also be reflected on the images. Other geologic features enhanced relative to their surroundings include an iron oxide gossan around the once productive Middle Butte mining area, and a marble unit presently being quarried for the manufacture of cement. Calcareous and alkaline soils of low fertility are also easily distinguished because of their relatively dark appearance on the Band 5 to Band 4 ratio image. Author

N75-21781# California Univ., Livermore. Lawrence Livermore Lab.
THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE
R. J. Lytle, R. M. Bevensee, and D. L. Lager 18 Oct. 1974 17 p refs
(Contract W-7405-eng-48)
(UCRL-51685) Avail: NTIS HC $3.25

The combination of a standard experimental procedure (four-probe electrical resistivity), a novel analytical technique (probabilistic potential theory), and a powerful inversion algorithm (optimization/generalized linear inverse) is proposed as a method for determining the subsurface electrical profile. It is proposed that the feasibility of the procedure be tested by analysis of field experiments in conjunction with scale-model laboratory experiments to validate the algorithms for general structure. The procedure should have great practical value in a wide variety of applications: hydrology, location and definition of the shape and extent of underground resources (e.g., geothermal reservoirs, ore bodies, or deposits of coal, sand, or gravel), faultline definition, and monitoring of changes in subsurface conditions (e.g., as in earthquake studies, in situ coal gasification, and burn-front studies of oil-shale gasification). Author (NSA)

N75-21782# Army Engineer Topographic Labs., Fort Belvoir, Va.
TERRAIN DATA OF MOUNT HAYES D-4 QUADRANGLE, FORT GREELY, ALASKA
T. R. Currin and J. W. Ingram, Jr. Aug. 1974 129 p refs
(DA Proj. 4A7-62707-A-854)
(AD-A002627; ETL-TR-74-7) Avail: NTIS CSCL 08/2

This report discusses a field investigation at Fort Greely, Alaska, conducted by the Geographic Sciences Laboratory (GSL) of the U.S. Army Engineer Topographic Laboratories (USAETL) as part of the Test and Analyze Experimental Color and Multiband Photography project. Field teams were deployed to collect terrain information in the areas of soils, vegetation, hydrology, and cultural features; various types of aerial imagery missions were flown coincident with the acquisition of ground data. A discussion of each of the areas of terrain data is presented. GRA

N75-21783# Kansas Univ. Center for Research, Inc., Lawrence. Lawrence Remote Sensing Lab.
PROJECT THEMIS: A CENTER FOR REMOTE SENSING Final Report, 16 Sep. 1967 - 15 Sep. 1973
F. T. Ulaby and R. K. Moore Jun. 1974 173 p refs
(Contract DAAK02-68-C-0089; DA Proj. 4A0-61102-B-81E)
(AD-A003266; CRES-TR-133-29) Avail: NTIS CSCL 08/6

This report summarizes the technical work accomplished under Project THEMIS, A Center for Remote Sensing at the University of Kansas during the period 16 September 1967 through 15 September 1973. The highlights of the four major areas forming the remote sensing system are presented. A detailed description of the latest radar spectrometer results is presented. GRA

N75-21784# National Ocean Survey, Rockville, Md.
WORLD MAPS ON THE AUGUST EPICYCLOIDAL CONFORMAL PROJECTION
Erwin Schmid May 1974 26 p refs
(COM-75-50052/0; NOAA-TR-NOS-63; NOAA-74120904) Avail: NTIS MF $2.25; SOD HC as C55.13:NOS63 CSCL 08B

Mapping equations and their inverses are developed in simplified form for the August two-cusped epicycloidal conformal projection and for the Lagrange family of conformal projections bounded by circular arcs. GRA

N75-21785# Applied Scientific Research Corp. of Thailand, Bangkok.
ANALYSIS OF ENVIRONMENTAL RESOURCES OF SELECTED REGIONS OF THAILAND: CENTRAL THAILAND Annual Report, 7 Jun. 1973 - 6 Jun. 1974
Khid Suvarnasuddhi 4 Sep. 1974 36 p
(Grant DA-RDRF-S92-544-73-G199; DA Proj. 2M0-61102-B-52B)
(AD-A002795) Avail: NTIS CSCL 08/7

An adequate knowledge of the physical and human resources of a country is essential for the difficult and complex task of effective security and development planning. The report analyzes, evaluates, assembles, and portrays the resources data of central Thailand in a coordinated manner. GRA

N75-21786# Stanford Research Inst., Menlo Park, Calif.
THE POTENTIAL FOR DEVELOPING ALASKAN COALS FOR CLEAN EXPORT FUELS, PHASE 1 Interim Report, Jan. - Jul. 1974
Dec. 1974 25 p
(Contract DI-14-32-0001-1516)
(PB-238539/1; OCR-108-INT-1) Avail: NTIS HC $3.25 CSCL 08I

Economic feasibility of a coal conversion facility using the large Beluga coal reserves of Alaska is discussed. Although this study is site-related and one of a kind research, the data generated should have general application to coal resource development in other western coal mining areas. Even though the Alaskan reserves are somewhat remote from markets for coal and coal-derived fuels, the proximity of the recoverable coal reserves to deep water ports--unique to Alaska and Washington--promises some interesting and potentially low cost transportation options for development. GRA

N75-21787# Geological Survey, Reston, Va.
MINOR ELEMENTS IN NONMAGNETIC CONCENTRATES FROM ALASKA Final Report
W. C. Overstreet, J. C. Hamilton, J. G. Boerngen, Sam Rosenblum, W. R. Marsh, and C. L. Sainsbury 1974 441 p refs
(PB-238989/8; USGS-GD-74-039) Avail: NTIS HC $11.25 CSCL 08D

Semiquantitative spectrographic analyses of 1,069 nonmagnetic concentrates were performed, mainly from former gold placer district. Ratios of background to anomalous values seemingly identify areas worthy of further exploration for base metals, platinum, molybdenum, tin, tungsten, and europium. GRA

N75-21788# Geological Survey, Reston, Va. Conservation Div.
RELATIONSHIPS BETWEEN BIDDING AND HYDROCARBON PRODUCTION OF THE FEDERAL OUTER CONTINENTAL SHELF (THROUGH 1970) Final Report
John Lohrenz and Hillary A. Oden Aug. 1974 36 p refs
(PB-238188/7; USGS-CD-74-001) Avail: NTIS HC$3.75 CSCL 08I

Bonuses are compared with royalty collected as a result of 26 Federal competitive lease sales for acreage on the outer continental shelf in which 1,588 leases were issued. The leases issued as a result of each sale are grouped according to bonus paid per acre. The data are analyzed and conclusions made as to the oil and gas industry's bidding behavior. GRA

N75-21789# Central Intelligence Agency, Washington, D.C. Office of Geographic and Cartographic Research.
CARTOGRAPHIC AUTOMATIC MAPPING (CAM), USER'S GUIDE PROGRAM DOCUMENTATION, VERSION 4
P. Frederic Stepler (IBM, Gaithersburg, Md.) and Warren E. Schmidt, ed. Dec. 1974 119 p refs Revised
(PB-238358/6; BGI-CD-75-1a-Rev; NTIS/DF-74/001a-Rev) Avail: NTIS HC $5.25 CSCL 08B

CAM is an IBM Systems 360 FORTRAN program that performs a wide variety of cartographic plotting tasks. It will connect points with straight lines or great circles and will draw line grids, range rings, ellipses, cones, azimuths and many other map features. Included also are a selection of 17 map projections that can be used in conjunction with either an 8,200 point World shoreline found on the CAM tape or from World Data Bank 1 of 100,000 points separately contained on Accession Number PB-223178. GRA

N75-21703 Joint Publications Research Service, Arlington, Va.
HYDRAULIC CONDUCTIVITY OF SOME SOILS OF THE DON-ARCHEDA SAND MASSIF
N. A. Muromtsev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 87-93 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 70-75 (For availability see N75-21693 13-42)

N75-21704 Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF FORECASTING THE GREEN TEA LEAF HARVEST BY THE METHOD OF PARAMETRIC SIMULATION
G. A. Arveladze *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 94-105 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 76-84 (For availability see N75-21693 13-42)

N75-21705 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS OF IDENTIFYING VEGETATION
V. I. Rachkulik and M. V. Sitnikova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 106-110 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 85-88 (For availability see N75-21693 13-42)

N75-22059 Kansas Univ., Lawrence.
REMOTE SENSING OF SURFACE PROPERTIES
Albert Wayne Biggs *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy: fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-21790 Pittsburgh Univ., Pa.
DEVELOPMENT OF A SOLUBLE REACTANTS AND PRODUCTS SECONDARY BATTERY Ph.D. Thesis
Edward Jean Lahoda 1974 122 p
Avail: Univ. Microfilms Order No. 75-4100

A theoretical and experimental study on the development of a secondary battery using soluble reactants and products was performed. A method for evaluating the theoretical performance of this type of secondary battery according to the specifications of energy and power to mass, volume, and cost ratios was developed and applied to ten prospective redox reactions. The four best combinations in the specifications studied were the Fe-Cr, Fe-Sn, Sn-Cr, and Fe-Ti systems. The properties of the half-cell separator (an anion membrane) are considered important. An experimental method for evaluating commercially available anion membranes according to the diffusion rate of multivalent cations through them was developed. Six different membranes were tested. The one with the lowest diffusion rate of the cations was the AMV anion membrane. It was found that a high anion transference number of high perm-selectivity was also a good indicator as to the suitability of the membrane for this type of secondary battery. Dissert. Abstr.

N75-21791 Pennsylvania Univ., Philadelphia.
ECONOMIC-ENVIRONMENTAL POWER DISPATCH Ph.D. Thesis
Jacob Zahavi 1974 380 p
Avail: Univ. Microfilms Order No. 75-2795

A dispatch procedure for power generation systems which meet the demand for power while taking into account both cost and emission considerations is developed. The control problem is formulated as a bicriterion optimization problem with two conflicting objective functions: operating costs and the combined pollution. A tradeoff curve, representing all alternative dispatch policies, is obtained for any demand level. The tradeoff curve is defined as the set of all efficient points between cost and pollution, and is computed in a parametric form by minimizing a penalty function. The economic interpretations of the tradeoff curve are discussed. An air pollution diffusion model is applied to points on the tradeoff curve to evaluate the alternative dispatch policies. Several measures, based on exposure to pollution, which serve as a first approximation to air pollution damage, are evaluated. The utility function is described by a quasi-concave function whose maximum point is found among points on the tradeoff curve. An interactive search method is devised, in order to find the dispatch policy that maximizes the utility function. The models are applied to a realistic power system. The computations are carried out for various demand levels and various weather conditions, and the comparative analysis of the results is discussed. Dissert. Abstr.

N75-21792*# Tyco Labs., Inc., Waltham, Mass.
NICKEL-CADMIUM CELLS Final Report, 30 Mar. 1972 - 30 May 1973
Edward J. Rubin and Michael J. Turchan Aug. 1974 116 p refs
(Contract NAS5-23102)
(NASA-CR-143715; C-227) Avail: NTIS HC $5.25 CSCL 10C

A high energy density nickel cadmium cell of aerospace quality was designed. The approach used was to utilize manufacturing techniques which produce highly uniform and controlled starting materials in addition to improvements in the overall design. Parameters controlling the production of plaque and both positive and negative plate were studied. Quantities of these

materials were produced and prototype cells were assembled to test the proposed design. Author

N75-21793# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
PROBLEMS IN ELECTRIC POWER PRODUCTION
G. Campos, G. Venuti, S. Donelli, S. Frullani, L. Maiani, and E. Tabet 23 Dec. 1973 72 p refs In ITALIAN
(ISS-T-73/16) Avail: NTIS HC $4.25

Some aspects of the energy problem are discussed which were the subject of a hearing. In particular the report deals with the health aspects of the main pollutants produced by different power stations (thermoelectrical, fueled both by oil and natural gas, nuclear) and with the current laws in several countries. Author

N75-21794*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR COLLECTOR PERFORMANCE EVALUATED OUTDOORS AT NASA-LEWIS RESEARCH CENTER
R. W. Vernon 1974 7 p refs Presented at Workshop on Solar Collectors for Heating and Cooling of Buildings, New York, 21-23 Nov. 1974; sponsored by NSF
(NASA-TM-X-71689) Avail: NTIS HC $3.25 CSCL 10A

An outdoor facility constructed to evaluate solar collector performance for conditions that would be encountered by collectors if they were incorporated in a solar heating/cooling system is described. Preliminary performance data is presented. Author

N75-21795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLANS AND STATUS OF THE NASA-LEWIS RESEARCH CENTER WIND ENERGY PROJECT
R. Thomas, R. Puthoff, J. Savino, and W. Johnson 1975 31 p refs Proposed for presentation at Joint Power Conf., Portland, Oreg., 28 Sep. - 1 Oct. 1975; cosponsored by IEEE and ASME
(NASA-TM-X-71701; E-8309) Avail: NTIS HC $3.75 CSCL 10A

Wind energy is investigated as a source of energy. The wind energy program that is managed by the NASA-Lewis Research Center is described. The Lewis Research Center's Wind Power Office, its organization, plans, and status are discussed. Major elements of the wind power project included are: an experimental 100 kW wind-turbine generator; first generation industry-built and user-operated wind turbine generators; and supporting research and technology tasks. Author

N75-21796*# Kanner (Leo) Associates, Redwood City, Calif.
WIND POWER INSTALLATIONS. PRESENT CONDITION AND POSSIBLE LINES OF DEVELOPMENT
Ye. M. Fateyev Washington NASA Mar. 1975 80 p refs Transl. into ENGLISH from Vetrosilovyye Ustanovki Sosttoyaniye i puti razvitiya (Moscow), 1959 80 p
(Contract NASw-2481)
(NASA-TT-F-16204) Avail: NTIS HC $4.75 CSCL 10A

Wind power is discussed as a source of energy, past, present and future. A brief summary of the history and development of windmills is presented. Tables of average wind velocity are included for different zones in the U.S.S.R. compiled from meteorological stations over a period of years. It is shown that the development of highly efficient wind power theory and engineering has led to the development of highly efficient wind-driven motors which use up to 42% of wind energy. The agricultural uses of wind-driven motors are also discussed. The matching of piston and centrifugal use of millstones with wind-driven motors are included. The use of free and unlimited wind energy is concluded to be efficient, particularly in agricultural and rural areas. Author

N75-21797# California Univ., Livermore. Lawrence Livermore Lab.
METHYL ALCOHOL PRODUCTION BY IN SITU COAL GASIFICATION
A. Pasternak 27 Aug. 1974 23 p refs
(Contract W-7405-eng-48)
(UCID-51600) Avail: NTIS HC $3.25

The need to use the large coal deposits of the U.S. as the raw material source for crude oil is discussed. Methyl alcohol can be produced from coal and used as a transportation fuel in internal combustion engines. The production route involves gasification of coal to carbon monoxide and hydrogen (synthesis gas) and high pressure catalytic conversion of these gases to methyl alcohol. In situ gasification of coal may be a less expensive way to produce synthesis gas than mining coal and gasifying it in surface plants. In situ gasification may also have less environmental impact and may be capable of using deep coal seams that cannot be mined economically. A process for in situ gasification leading to methyl alcohol production is described, and the thermodynamics and costs of the process are outlined. Capital requirements are estimated to be $354 million for annual production of methyl alcohol with a fuel value of 81 trillion Btu's. The selling price is estimated to be $1.04 per million Btu's (5.9 cents per gallon). Author (NSA)

N75-21798# Pennsylvania Univ., Philadelphia. Dept. of Metallurgy and Material Science.
HIGH TEMPERATURE GALVANIC-CELL INVESTIGATIONS USING SOLID ELECTROLYTES Final Technical Report
W. L. Worrell 1 Oct. 1974 5 p refs
(Contract AT(11-1)-3006)
(COO-3006-1) Avail: NTIS HC $3.25

The thermodynamic properties of the solid Ta-Mo, Ta-W, and Nb-Mo systems at temperatures between 1100 and 1300 K have been measured using galvanic cell techniques. Thermodynamic activities in all three binary systems exhibit negative deviations from ideality. The negative deviations are smaller in the Ta-W system than those observed in the Ta-Mo and Nb-Mo systems. The excess integral free energy is approximately equal to the integral enthalpy of mixing. The observed small negative values for the excess integral entropy of mixing are the result of vibrational contributions and/or the presence of short range order. Overvoltage phenomena at electrode-electrolyte interface were studied. Results inicate that the major oxygen transport across the electrode-electrolyte interface is between the electrolyte and the metal particles. Author (NSA)

N75-21799# Brookhaven National Lab., Upton, N.Y.
COAL COMBUSTION AND DESULFURIZATION IN A ROTATING FLUIDIZED BED REACTOR
S. Chalchal, T. V. Sheehan, and M. Steinberg Oct. 1974 24 p refs Sponsored by ERDA
(BNL-19308) Avail: NTIS HC $3.25

The use of coal as a fuel for electrical power generation is limited by its sulfur content, resulting in high sulfur pollution of the flue gas from its use in conventional combustion. Sulfur removal is achieved by burning the coal with limestone and dolomite in a fluidized bed. An evaluation of the fluidized bed combustion process is made and the principles of rotating fluidized bed combustion are presented. A preliminary design of pressurized fluidized bed combustor is given. NSA

N75-21800# California Univ., Livermore. Lawrence Livermore Lab.
DIRECT CONVERSION OF PLASMA ENERGY TO ELECTRICITY FOR MIRROR FUSION REACTORS
R. W. Moir, W. L. Barr, and G. A. Carlson 24 Sep. 1974 17 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA
(UCRL-76051) Avail: NTIS HC $3.25

Direct conversion of plasma and ion beam energy to electricity for mirror fusion reactors is described. Selective leakage, magnetic expansion, electron separation, deceleration, and collection of ions are discussed. An experiment testing all processes except selective leakage gave an overall efficiency of 86.5 + or - 1.5% for a 22-stage collector. Computer calculations of these same processes gave an efficiency of 88.6 + or - 1.5%, agree. Experiments on a two-stage collector gave 65% efficiency compared to 69% calculated efficiency. One- two-, and 22-stage converters were studied under reactor-like conditions with a large computer simulation code that accounts for space charge, secondary electrons, and finite, realistic electrode shapes. Laboratory tests of mono-energetic beam direct conversion gave

96% efficiency for a 2-keV low power dc beam and 70% for a dc 20 keV, 1-kW beam. Author (NSA)

N75-21801# Australian Inst. of Nuclear Science and Engineering, Lucas Heights.
AINSE ENGINEERING CONFERENCE
Aug. 1974 76 p refs Conf. held at Lucas Heights, Australia, 19-21 Aug. 1974
(Conf-740814-Absts) Avail: ERDA Depository Libraries HC $7.00

Abstracts of sixty papers are presented. Topics include: Energy and nuclear power, fuel cycle, control systems, fuel elements, and mechanical aspects, energy conversion, heat and mass transfer, turbulence, fluid flow, fluctuation and noise analysis. NSA

N75-21802# Sandia Labs., Albuquerque, N.Mex.
FLYWHEEL ENERGY SYSTEMS
F. Biggs Nov. 1974 46 p refs
(Contract AT(29-1)-789)
(SAND-74-0113) Avail: NTIS HC $3.75

Concepts are developed for advanced flywheels made of high-strength filamentary composite materials. The various flywheel systems described are important to the clean and efficient use of energy. Recent related work is summarized and several relevant research areas are identified. Author (NSA)

N75-21803# Parsons (Ralph M.) Co., Pasadena, Calif.
TECHNICAL EVALUATION SERVICES, CLEAN LIQUID AND/OR SOLID FUELS FROM COAL Technical Progress Report, Oct. 1972 - Aug. 1974
Nov. 1974 13 p
(Contract DI-14-32-0001-1234)
(PB-237216/7; POCR-82-INT-4) Avail: NTIS HC $3.25 CSCL 07A

A preliminary design and capital cost estimate report was prepared describing a coal conversion demonstration plant capable of producing 25,000 bbl/day of clean boiler fuels. Also completed was a preliminary process design and economic evaluation for a Fischer-Tropsch process plant to process 3,500 TPD of coal. Work is in the later stage of completion for a preliminary design and economic analysis of a conceptual nominal 25,000-TPD commercial COED-based pyrolysis plant with char gasification and electrical power generation. Reviews of process design, mechanical design, and construction progress are nearly completed for the SRC pilot plant located at Tacoma, Washington. GRA

N75-21804# Mallory Battery Co., Tarrytown, N.Y.
NON-HAZARDOUS PRIMARY LITHIUM-ORGANIC ELECTROLYTE BATTERY BA-5590 ( )/U Final Report, Jul. 1973 - Sep. 1974
Thomas Watson Oct. 1974 32 p
(Contract DAAB07-73-C-0282)
(AD-A003312; ECOM-0282-73-F) Avail: NTIS CSCL 10/3

The subject concerns the development and fabrication of Battery No. BA-5590( )/U in accordance with the performance/safety requirements as defined in the Technical Guidelines for Non-Hazardous Primary Lithium-Organic Electrolyte Batteries dated 29 March 1973. The primary concern has been the fabrication of the subject batteries in conference with these guidelines and most important, the development of effective safety mechanisms to insure non-hazardous operation under all conditions of storage, use and operation. Basic considerations for such safety mechanisms were system reliability, effectiveness, economics and adaptability to eventual automated production. The electrolyte consists of 70% sulfur dioxide by weight. The remaining 30% contains lithium bromide and the organic solvents. GRA

N75-21805# Army Electronics Command, Fort Monmouth, N.J.
DATA ACQUISITION TEST REPORT ON OH-58A NiCad BATTERY OPERATION Final Technical Report
James T. Maguire Oct. 1974 79 p refs
(DA Proj. 1F2-64201-DC-97)
(AD-A001526; ECOM-4267) Avail: NTIS CSCL 10/3

This report describes the data collection effort on an OH-58A to provide information to allow implementation of a laboratory simulation of battery loading under controlled conditions. A tabulation and graphical display of the recorded results are contained in Appendix 3. Procedures for the installation and testing have been detailed in Appendices 1 and 2. GRA

N75-21806# Army Electronics Command, Fort Monmouth, N.J.
CYLINDRICAL ERBIUM OXIDE RADIATOR STRUCTURES FOR THERMOPHOTOVOLTAIC GENERATORS Research and Development Technical Report
Guido E. Guazzoni and Emil Kittl Aug. 1974 33 p refs
(DA Proj. 1S7-62704-AH-94)
(AD-A001525; ECOM-4249) Avail: NTIS CSCL 10/2

Results of an experimental investigation are reported which cover the fabrication and evaluation of slip-casted and hot pressed erbium oxide cylinders and silicon carbide structures coated with erbium oxide. Suitable erbium oxide cylindrical structures will be used as radiating mantles in thermophotovoltaic converter systems. The pure erbium oxide cylindrical mantles were found to be deficient in thermal shock resistance which resulted in cracking of the mantles and extremely low thermal cycle life. The erbium oxide coated silicon carbide structures provided satisfactory thermal cycling capability up to 1500C but their spectral emission showed a large content of background radiation which manifested itself in an increased amount of undesirable interband emission. Higher optical density of the erbium oxide coating, to provide reduction of unwanted background radiation, is necessary to make these structures of practical use. GRA

N75-21807# General Electric Co., Philadelphia, Pa. Space Div.
INTEGRAL GLASS COVERS FOR SILICON SOLAR CELLS Final Technical Report, 19 May 1971 - 31 Oct. 1974
Harry W. Rauch, Sr. and Donald R. Ulrich 31 Oct. 1974 70 p refs
(Contract F33615-71-C-1656; AF Proj. 3145)
(AD-A002846; AFAPL-TR-74-14) Avail: NTIS CSCL 10/2

A program of inorganic glass development resulting in the formulation of numerous compositions for direct fusion to silicon solar cells was conducted. The glasses were sedimented as -200 mesh particles onto the front surface of the solar cells, then fused, to form an integral cover, at temperatures ranging from 510 C to 600 C depending on solar cell type and glass composition. Coatings, at least 50 microns thick, were applied to both N/P aluminum-contacted and silver/titanium-contacted cells. Electrical characterization of the bare and coated cells, before and after electron irradiation, shows that some cells can be integrally covered by this technique without degrading their conversion efficiency below an acceptable level. Glass preparation, compositional modifications, and the effect of these changes on fusion temperature, radiation resistance, transmission, and thermal expansion are discussed. GRA

N75-21808# Defence Research Establishment Ottawa (Ontario).
THE STUDY OF MAGNESIUM/SILVER CHLORIDE BATTERIES EMPLOYING VARIOUS ELECTROLYTES AND INHIBITORS
G. D. Nagy and P. J. Powell Oct. 1974 21 p refs
(AD-A002789; DREO-R-702) Avail: NTIS CSCL 10/3

Measurements have been made of both temperature and voltage, during and after discharge, on magnesium/silver chloride batteries. These measurements were made on single- and multiple-cell stacks at 45 C. A study of cell behavior was carried out to determine the possibility of decreasing the corrosion of the magnesium and extending the length of run-out of the present system. An explanation is given for the high corrosion rate of magnesium in 20% LiCl solutions with 0.5% $Na_2Cr_2O_7$. Possible means of controlling this rate are also presented. GRA

N75-21809# Invention Talents, Inc., Columbus, Ohio.
ANALYSIS OF ACCELERATED LIFE TEST DATA FOR AEROSPACE NICKEL-CADMIUM CELLS Final Report, Nov. 1972 - Jul. 1974
E. A. Roeger, Jr., J. McCallum, and G. H. Miller Oct. 1974 131 p refs
(Contract F33615-73-C-2024; AF Proj. 3145)
(AD-A002848; AFAPL-TR-74-75) Avail: NTIS CSCL 10/3

A process was developed for the accelerated life testing of a particular cell or battery which comprises the comparison and extrapolation of the end of discharge voltages plotted versus

the logarithm of the cycle number in combination with prior knowledge about the probable cycles to failure for similar cells or batteries under the same end use conditions. When the slope of the voltage-log cycle line in the test can be made to coincide with similar slopes from prior knowledge, the battery under test will have the same cycle life and failure mechanism as prior cells or batteries. Acceleration of the test results is achieved because a duplication slope for the data obtained during about the first hundred cycles indicates the probable presence of thousands of cycles anticipated by the prior knowledge. GRA

N75-21810# Arizona State Fuel and Energy Office, Phoenix.
PUTTING THE SUN TO WORK: A HISTORY AND DIRECTORY OF CURRENTLY AVAILABLE SOLAR ENERGY APPLICATIONS
Ken Bacher 1974 31 p refs
(PB-238189/5) Avail: NTIS HC $3.75 CSCL 10B

A short history in non-technical terms of solar energy development is presented. Methods of collection are discussed for residential, commercial, and industrial applications. A listing of solar energy equipment manufacturers for hot water heaters, collectors, swimming pool heaters, total home systems, glazing systems for solar control, wind power, and solar cells is included. GRA

N75-21811# Battelle Columbus Labs., Ohio.
ENERGY R/D DATA WORKSHOP
Nov. 1974 37 p Workshop held at Gaithersburg, Md., 6-7 May 1974 Prepared in cooperation with NBS, Washington, D. C. and AEC, Washington, D. C.
(Grant NSF GN-42243)
(PB-237493/2) Avail: NTIS HC $3.75 CSCL 05B

The problems of energy data priorities and energy data tagging were discussed in two separate working sessions. Background for these sessions came from a panel discussion relating forthcoming energy R and D programs to data dissemination programs and from a series of prepared talks concerning various aspects of energy data. GRA

N75-21812# Pennsylvania State Univ., University Park. Coal Research Section.
DEPENDENCE OF COAL LIQUEFACTION BEHAVIOR ON COAL CHARACTERISTICS Interim Report, Jan. 1973 - Jun. 1974
Jan. 1975 45 p refs
(Contract DI-14-01-0001-390)
(PB-238522/7; OCR-61-INT-9) Avail: NTIS HC $3.75 CSCL 10A

Liquefaction behavior of coal samples was studied. The samples had widely differing sulfur contents (up to 6%) but the oils produced had sulfur contents less than 0.5% in almost all cases. In addition, the results strongly indicated that in a number of cases the mineral constituents of coals, usually considered as unwanted impurities, may actually have a beneficial effect as additional catalysts for the liquefaction process. GRA

N75-21813# Argonne National Lab., Ill.
A DEVELOPMENT PROGRAM ON PRESSURIZED FLUIDIZED-BED COMBUSTION Interim Report, Jul. 1973 - Jun. 1974
G. J. Vogel, W. M. Swift, J. F. Lenc, P. T. Cunningham, and W. I. Wilson Jan. 1975 139 p refs
(Contract DI-14-32-0001-1543)
(PB-238969/0; ANL/ES-CEN-1007; OCR-93-INT-1) Avail: NTIS HC $5.75 MF $2.25; SOD HC as 163.10:93/INT.1 CSCL 07A

A bench scale, fluidized bed combustion pilot was used to evaluate the effects of operating variables on response variables such as SO2 and NO levels in the flue gas, combustion efficiency, additive utilization, and heat transfer coefficients. The combustor was successfully tested using a variety of coals: a highly caking, high volatile bituminous coal, a high ash subbituminous coal, and a low heating value lignite. Material balance data are reported for four trace elements--Hg, Pb, Be, and F. The kinetics of the reaction of half-calcined dolomite with SO2 at atmospheric pressure were found to be first order with respect to the SO2 concentration in the presence of H2O vapor, and approximately three fourths order in the absence of H2O vapor. GRA

N75-21814# Rhode Island State Planning Program, Providence.
AVERAGE MOTOR FUEL CONSUMPTION RATES FOR ESTIMATING AUTOMOBILE TRAVEL IN RHODE ISLAND
Oct. 1974 28 p
(PB-238953/4; RISPP-TP-74-46) Avail: NTIS HC $3.75 CSCL 21D

Average fuel consumption rates were calculated for 1969 - 1973 using a Federal Highway Administration method developed and published in 1972. Travel estimates in vehicle miles traveled were also calculated. These calculations were based on Rhode Island Department of Transportation data. GRA

N75-21815# Western Forest Products Lab., Vancouver (British Columbia).
ENERGY PLANTATIONS: SHOULD WE GROW TREES FOR POWER PLANT FUEL
R. S. Evans Jul. 1974 23 p refs
(PB-238417/0; VP-X-129) Avail: NTIS HC $3.25 CSCL 10B

The proposal that trees, a renewable resource, might be cut as fuel for electric-power plants is examined. The Pacific northwest is suggested as a likely location for an energy plantation. Wood and bark production in dense red alder stands is shown to be exceptionally high and land area requirements are not excessive. GRA

N75-21816# United Aircraft Corp., East Hartford, Conn.
FEASIBILITY DEMONSTRATION OF A SOLAR POWERED TURBOCOMPRESSOR AIR CONDITIONING AND HEATING SYSTEM Quarterly Progress Report, 15 Jun. - 15 Sep. 1974
F. R. Biancardi 15 Sep. 1974 48 p refs
(Contract NSF C903)
(PB-238570/6; UARL-N951923-1; NSF/RA/N-74-105; QPR-1) Avail: NTIS HC $3.75 CSCL 10B

The feasibility of operating a Rankine cycle turbocompressor air conditioning and heating system was demonstrated for temperature levels consistent with flat plate solar collectors. Primary emphasis was placed on defining the operating conditions of components and selecting the working fluid for the demonstration turbocompressor system. Emphasis was also placed on the disassembly and check of the existing turbocompressor components, and the modification or procurement of new components required for the laboratory demonstrator. GRA

N75-21817# Transportation Systems Center, Cambridge, Mass.
ENERGY STATISTICS. A SUPPLEMENT TO THE SUMMARY OF NATIONAL TRANSPORTATION STATISTICS Final Report, 1961 - 1973
William F. Gay Aug. 1974 140 p
(PB-236767/8; DOT-TSC-OST-74-12) Avail: NTIS HC $5.75 CSCL 21D

A compendium is presented of selected time-series data describing the transportation, production, processing, and consumption of energy. The report is divided into three main sections. The first, entitled Energy Transport, contains such items as the revenues and expenses of oil pipeline companies, number and capacities of U.S. tank ships, and the total crude oil transported in the U.S. by method of transportation. The second section, entitled Reserves, Production, and Refining, reveals the growth over time of the U.S. oil and natural gas reserves, refinery capacity, and yields. Trends in the demand for fuel and power are displayed in the third section, entitled Energy Consumption. Throughout this part, the transportation sector is emphasized. Included are the gasoline and oil costs of automobiles of different sizes, the consumption of petroleum by type of product, the electrical energy consumed by the local transit industry, and other important statistics describing the supply and demand for energy. GRA

N75-21818# Sobotka and Co., Inc., New York.
INDUSTRIAL ENERGY STUDY OF THE PETROLEUM REFINING INDUSTRY Final Report
May 1974 98 p refs
(Contract DI-14-01-0001-1656)
(PB-238671/2; FEA/EI-1656) Avail: NTIS HC $4.75 CSCL 10A

Information is provided on the structure of the petroleum refining industry as well as on energy consumption patterns and the potential for energy substitution and conservation. GRA

N75-21819# North Carolina State Dept. of Administration, Raleigh. State Planning Div.
A STATE ENERGY MANAGEMENT PLAN FOR NORTH CAROLINA, PHASE 1: A QUANTITIVE DESCRIPTION OF THE CURRENT SITUATION AND ANALYSIS OF THE DETERMINANTS AND CONSEQUENCES OF FUTURE ENERGY USE Final Report
Jun. 1974 224 p refs Prepared in cooperation with Res. Triangle Inst., Durham, N. C.
(PB-238197/8) Avail: NTIS HC $7.25 CSCL 10A

A basic requirements scenario related to projected socio-economic growth in North Carolina is developed, assuming current trends in energy use patterns, in order to set objectives, develop policies, devise plans, establish budgets, and implement programs for future energy consumption. GRA

N75-21820# TRW Systems Group, Redondo Beach, Calif. Dept. of Chemical Sciences.
DEVELOPMENT PROGRAM FOR SOLID ELECTROLYTE BATTERIES Final Report, 1 Jan. 1973 - 30 Jun. 1974
Oct. 1974 50 p
(PB-238691/0; TRW-20078-6002-RU-00; EPRI-127-1) Avail: NTIS HC $3.75 CSCL 10C

The solid electrolyte development effort included densification by cold pressing followed by sintering and by hot pressing. A resistivity of 30 ohm cm at 300C (lkHz) was observed for hot-pressed magnesium oxide-enriched-alumina. Cold pressing and sintering magnesium oxide-enriched beta-alumina resulted in solid electrolyte with a 13 ohm cm resistivity. Lithium oxide-stabilized beta 2 prime-alumina was prepared with a resistivity of approximately 5 ohm cm but this value increased with time. No problems that would make Na-S batteries unsuitable for load leveling were identified. Future work will lead to larger cells and cell stacks to demonstrate the performance of Na-S batteries in a load leveling application. GRA

N75-21821# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
FEASIBILITY STUDY OF A 100 MEGAWATT OPEN CYCLE OCEAN THERMAL DIFFERENCE POWER PLANT
J. L. Boot and J. G. McGowan Aug. 1974 100 p refs
(Grant NSF GI-34979)
(PB-238571/4; TR-74-3; NSF/RANN/SE/GI-34979/TR-74-3; NSF/RA/N-74-109) Avail: NTIS HC $4.75 CSCL 10B

A technical feasibility study is reported on a 100 Mw gross output open Rankine cycle powerplant driven by the ocean thermal difference. Key components of the power system were: A radial inflow turbine designed for optimum efficiency with a blade diameter of 235 feet; a falling film evaporator 250 feet in diameter and 16 feet high; a falling film deaerator system 45 feet in diameter and 32 feet high; a shed-in-tube condenser (137,000 1 inch O.D. tubes 39 ft. long) producing 25 million gallons per day of fresh water; and a single cold water pump designed specifically for this system. The net electrical power output was approximately 59.1 Mw. GRA

N75-21822# Houston Univ., Tex. Dept. of Mechanical Engineering.
THE EVALUATION OF SURFACE GEOMETRY MODIFICATION TO IMPROVE THE DIRECTIONAL SELECTIVITY OF SOLAR ENERGY COLLECTORS Quarterly Report, 1 Jul. - 30 Sep. 1974
John R. Howell and Richard B. Bannerot 31 Oct. 1974 16 p refs
(Grant NSF GI-41003)
(PB-238509/4; UHME/Sol/3; NSF/RANN/SE/GI-41003/PR-74-3; NSF/RA/N-74-143; QR-3) Avail: NTIS HC $3.25 CSCL 10B

The performance of the flat plate collector can be greatly enhanced with the use of spectrally (wavelength) and/or directionally selective surfaces. This document reports on progress in examining two model geometries to determine the optimum parameters that will maximize the directional selectivity. GRA

N75-21823# Battelle Columbus Labs., Ohio.
A REVIEW OF THE PROJECT INDEPENDENCE REPORT SUBMITTED TO OFFICE OF ENERGY RESEARCH AND DEVELOPMENT, NATIONAL SCIENCE FOUNDATION, 10 JANUARY 1975 Final Report
Samuel Globe and Richard A. Craig 10 Jan. 1975 183 p refs
(Contract NSF C-914)
(PB-238791/8) Avail: NTIS HC $7.00 CSCL 10A

The Project Independence Report (PIR) issued in November 1974 by the Federal Energy Administration is evaluated. A review includes comments on the PIR as a whole, and also provides detailed critiques of the various topics, strategies, and scenarios as they are discussed by the PIR, including energy and fuel supplies, conservation and demand management, environmental assessment, economic and social impacts, international assessment, and the analytical approach. Special attention is given to the policy implications of the PIR strategies. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-21824 Cornell Univ., Ithaca, N.Y.
THE EFFECTS OF INCREASING ATMOSPHERIC CARBON DIOXIDE AND PARTICLES ON PLANT PHOTOSYNTHESIS Ph.D. Thesis
Ruth Alison Lister 1974 168 p
Avail: Univ. Microfilms Order No. 75-4257

Modelling techniques were used to predict the effect of two constituents of atmospheric pollution, carbon dioxide and suspended particulate matter or aerosols, on plant photosynthesis in two agricultural plant communities, maize and sugar beets. The predicted effect on climate is one of tropospheric warming. The photosynthetic response of sugar beets changes only slightly when net radiation is increased at 30% diffuse radiation to the clear sky level. However, for maize, which has a more marked temperature response, this made a big difference in the temperature range of these simulations. As CO2 increases, photosynthesis increases. Also the temperature response of C3 plants changes making sugar beets more sensitive to the thermal regime. The effects on water use efficiency and sensible and latent heat flux are also discussed. Cloud cover, in combination with heavy aerosol loading, would reduce total visible radiation sufficiently to decrease photosynthesis even under optimal thermal conditions. Dissert. Abstr.

N75-21825 North Carolina Univ., Chapel Hill.
AEROSOL FORMATION FROM GAS PHASE REACTIONS OF OZONE AND OLEFIN IN THE PRESENCE OF SULFUR DIOXIDE Ph.D. Thesis
David Nicholas McNelis 1974 232 p
Avail: Univ. Microfilms Order No. 75-4848

The dark phase reaction of olefin-ozone-sulfur dioxide was studied in an attempt to elucidate the mechanism involved in the oxidative consumption of the sulfur dioxide. The effect of several variables on the reaction stoichiometry and on the aerosol production was also investigated. These variables included the reactant concentrations, the relative humidity, molecular oxygen concentration and the olefin species although propylene was the primary olefin studied. The stoichiometry of the propylene-ozone reaction was found to be a smooth function of the initial concentration ratio of these species. The olefin/ozone consumption was > 1 for a system in which the olefin was initially in excess and < 1 for a system having an initial ozone excess. The consumption ratio was unaffected by the addition of sulfur dioxide or by varying the relative humidity over the range of 20 to 38 percent. Molecular oxygen had a significant effect on the reaction stoichiometry and product formation in the propylene-ozone thermal reaction. Dissert. Abstr.

N75-21826 Colorado Univ., Boulder.
TRACE ELEMENT STUDY IN A PULVERIZED-COAL-FIRED POWER PLANT Ph.D. Thesis
John William Kaakinen 1974 200 p

Avail: Univ. Microfilms Order No. 75-3795

Trace element concentrations and total-mass-flow rates of solid and liquid materials in all inlet and outlet streams of a pulverized-coal-fired power plant were obtained for the purpose of studying the fate of trace elements from coal combustion. Concentrations of 18 elements were determined by atomic absorption spectrophotometry, X-ray flourescence spectroscopy, or wet chemistry. Overall mass balances of 9 elements gave closures within 10 percent. Imbalances greater than 10 percent were due to an incomplete set of chemical analyses for some elements, insufficiently accurate analyses (especially in coal) of other trace elements, and probable vapors and very fine aerosols that eluded efficient collection in the standard particulate sampling trains. Dissert. Abstr.

N75-21827 State Univ. of New York, Albany.
POSITIVE IONS OF ATMOSPHERIC IMPORTANCE Ph.D. Thesis
John Alfred Kadlecek 1974 157 p
Avail: Univ. Microfilms Order No. 75-2955

Ions in the atmosphere are reported which are capable of influencing the nature of, and the rates of, chemical reactions. The purpose of this work was to investigate ion-molecule reactions that are potentially important as sinks for trace gases. The reaction environment was similar to the naturally occurring troposphere, except that impurities were reduced to permit the isolation of particular reactions. Dissert. Abstr.

N75-21828 Texas A&M Univ., College Station.
EFFECTS OF WATER DISPERSIONS AND WATER SOLUBLE FRACTIONS OF TWO CRUDE AND TWO PROCESSED OILS ON THREE MARINE ALGAL SPECIES Ph.D. Thesis
Earl Ronald Mills, Jr. 1974 102 p
Avail: Univ. Microfilms Order No. 75-2877

Marine algal species, Isochrysis galbana Parke (haptophyte), Glenodinium halli Freudenthal and Lee (dinoflagellate) and Cyclotella nana Hustedt (diatom) were exposed to the water-soluble fractions (WSF) and oil-in-water dispersions (OWD). Tests were conducted in 72-hour static cultures and effects were noted by measuring changes in population growth rates and chlorophyll a levels. Infared measurements were made to determine the actual dissolved petroleum levels in the WSF. The concentrations of the test materials (OWD and WSF) required to reduce growth rates and chlorophyll a levels to 50% of the same parameters in the untreated controls indicated that the refined products were more toxic than the crude oils. Subcultures of organisms from treated cultures showing marked reductions in growth rates resumed normal to near normal growth rates after incubation in fresh medium for 6 to 7 days. The relative toxicity of the petroleum WSF was not apparently related to the dissolved hydrocarbon concentrations but rather to the enrichment of the aqueous phase with aromatic compounds. Dissert. Abstr.

N75-21829 Texas A&M Univ., College Station.
A STUDY OF THE EFFECTS OF THE URBAN MESOCLIMATE ON LOCAL AND REGIONAL POLLUTION POTENTIAL IN SOUTHEAST TEXAS Ph.D. Thesis
Malcolm Manley Pendergast 1974 225 p
Avail: Univ. Microfilms Order No. 75-2881

The extent of influence of the pollution plume of Houston, Texas, was determined for winter and spring 1972, through several techniques based upon routine meteorological data. One method involved the use of 9-hr trajectories of hypothetical air parcels calculated from adjusted surface winds at 3-hr intervals. Wind speed, stability, and mixing depths obtained from soundings made at Houston were used to determine the dilution factor along each trajectory. The summary of air trajectories for spring shows different patterns for different times of day. Results of the urban survey indicate that the vertical profiles of temperature and humidity, within the suburban area are of the same for as profiles measured by other investigators for rural areas. Dissert. Abstr.

N75-21830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELEMENTAL COMPOSITION OF SUSPENDED PARTICULATES AS FUNCTIONS OF SPACE AND TIME IN CLEVELAND, OHIO
H. E. Neustadter, R. B. King, and J. S. Fordyce 1975 14 p refs Proposed for presentation at 68th Ann. Meeting of the Air Pollution Control Assoc., Boston, 15-20 Jun. 1975
(NASA-TM-X-71688; E-8288) Avail: NTIS HC $3.25 CSCL 13B

An approach to the analysis of a very large elemental concentration data set. The particular data considered was generated by instrumental neutron activation and emission spectroscopy analyses of over 750 24-hour ambient air particulate samples collected at 16 sites in Cleveland, Ohio, during the 15 months from August 1971 thru October 1972. Examples are presented that show the use of multiple approaches to interpreting the data, including pairwise correlation statistics, selective data plotting and cluster analysis. Author

N75-21831*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIR POLLUTION SOURCE IDENTIFICATION
J. Stuart Fordyce [1975] 35 p refs Presented at the Sources and Emissions Workshop of the 2d Interagency Comm. on Marine Sci. and Eng. Conf., Argonne, Ill., 25-27 Mar. 1975
(NASA-TM-X-71704; E-8313) Avail: NTIS HC $3.75 CSCL 13B

The techniques available for source identification are reviewed: remote sensing, injected tracers, and pollutants themselves as tracers. The use of the large number of trace elements in the ambient airborne particulate matter as a practical means of identifying sources is discussed. Trace constituents are determined by sensitive, inexpensive, nondestructive, multielement analytical methods such as instrumental neutron activation and charged particle X-ray fluorescence. The application to a large data set of pairwise correlation, the more advanced pattern recognition-cluster analysis approach with and without training sets, enrichment factors, and pollutant concentration rose displays for each element is described. It is shown that elemental constituents are related to specific source types: earth crustal, automotive, metallurgical, and more specific industries. A field-ready source identification system based on time and wind direction resolved sampling is described. Author

N75-21832# Atomic Energy Commission, Albuquerque, N.Mex.
PROCEEDINGS OF THE SECOND AEC ENVIRONMENTAL PROTECTION CONFERENCE
Jul. 1974 567 p refs Conf. held at Albuquerque, N. Mex., 16-19 Apr. 1974
(WASH-1332(74)-Vol-1; Conf-740406-P1) Avail: NTIS HC $13.00

Abstracts of selected papers are presented. The following major topics are included: pollution monitoring; environmental policy; waste management, waste utilization, waste disposal, and radioactive wastes; and effluent reduction. J.M.S.

N75-21833# Atomic Energy Commission, Albuquerque, N.Mex.
PROCEEDINGS OF THE SECOND AEC ENVIRONMENTAL PROTECTION CONFERENCE
Jul. 1974 590 p refs Conf. held at Albuquerque, N. Mex., 16-19 Apr. 1974
(WASH-1332(74)-Vol-2; Conf-740406-P2-Vol-2) Avail: NTIS HC $3.25

For abstract, see N75-21832.

N75-21834# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
STUDY AND EVALUATION IN THE FIELD OF ENVIRONMENTAL POLLUTION RELATED TO THE UTILIZATION OF ARMY MATERIEL Final Report
Oct. 1974 37 p refs
(Contract DAAD05-72-C-0053)
(AD-A003335; AFLRL-50) Avail: NTIS CSCL 13/2

For the past three years, the U.S. Army Fuels and Lubricants Research Laboratory has been engaged in a program of research on emission-related phenomena. Activities within the several phases of this work have been quite diverse, and, consequently, the numerous papers, reports, and other documents detailing specific findings have been distributed through a variety of Army and professional society organizational channels. It is the purpose of this Final Summary Report to provide: An overview of the program phases, emphasizing the objective, approach, and accomplishments of each; and adequate reference guidelines

(bibliography) to permit the reader desiring greater detail to quickly secure the appropriate publication. Projects include fuel, engine, lubricant, and analytical research, and pollution control liason. GRA

N75-21835# Abcor, Inc., Cambridge, Mass. Walden Research Div.
EVALUATION OF INSTRUMENTATION FOR MONITORING TOTAL MERCURY EMISSIONS FROM STATIONARY SOURCES Final Report, Jul. 1972 - Jun. 1974
L. Katzman, R. Lisk, and J. Ehrenfeld Jun. 1974 150 p refs (Contract EPA-68-02-0590)
(PB-238323/0; EPA-650/2-74-039) Avail: NTIS HC $5.75 CSCL 13B

Monitoring instrumentation which represents the current state-of-the-art in measurement of total mercury emissions from stationary sources are evaluated. Field tests were conducted at the following sources: (1) Secondary processing of mercury; (2) chloralkali production; and (3) nonferrous (zinc) smelting. From the evaluation of these data the investigators concluded that available mercury measuring instrumentation can be adapted for the measurement of total mercury emissions from certain sources, in particular, chlor-alkali plants. GRA

N75-21836# Stone (Ralph) and Co., Inc., Los Angeles, Calif.
FORECASTS OF THE EFFECTS OF AIR AND WATER POLLUTION CONTROLS ON SOLID WASTE GENERATION Final Report
Ralph Stone and David E. Brown Dec. 1974 830 p refs (Contract EPA-68-03-0244)
(PB-238819/7; EPA-670/2-74-095b) Avail: NTIS HC $19.25 CSCL 13B

The effects of air and water pollution controls on solid waste generation were evaluated. The solid wastes from pollution control were identified for individual industrial sectors by their original air or water pollutant constituents, and the treatment process applied. The wastes were categorized by type and by location (rural or urban). Total solid wastes from pollution control activities were estimated for 1971 and projected for 1975, 1980, and 1985. Particulates and sulfur oxides were identified as the major air pollutants capable of generating solid wastes when treated; suspended solids and biological oxygen demand were identified as the principle sources for the impact of water pollution control on solid wastes. Important sectors generating solid wastes are included. GRA

N75-21837# National Environmental Research Center, Research Triangle Park, N.C.
AIR POLLUTION EFFECTS ON CATASTROPHIC FAILURE OF METALS
Jon Gerhard and Fred H. Haynie Nov. 1974 39 p refs
(PB-238290/1; EPA-650/3-74-009) Avail: NTIS HC $3.75 CSCL 13B

Air pollutants contribute to the catastrophic failure of metal structures through the mechanisms of stress-corrosion cracking, corrosion fatigue, and hydrogen embrittlement. The 'Silver Bridge' catastrophe, LORAN tower parts failures, aircraft parts failures resulting in accidents, and communications equipment failures are examples cited that were related to air pollution. An economic analysis of these failures indicated that accompanying injury and loss of life is an annual economic loss to the nation of from $50 million to $100 million. GRA

N75-21838# National Environmental Research Center, Cincinnati, Ohio.
POLLUTION CONTROL TECHNOLOGY ASSESSMENT: PROCEEDINGS OF AN ENVIRONMENTAL RESOURCES CONFERENCE
Oct. 1974 196 p refs Conf. held at Columbus, Ohio, 1-3 May 1974 Prepared in cooperation with Battelle Columbus Labs., Ohio
(PB-238303/2; EPA-670/9-74-006) Avail: NTIS HC $7.00 CSCL 13B

The volume is a compilation of papers presented at the third of a series of conferences on environmental matters. The conference subject area concerned a multifaceted assessment of water pollution control technology. Session topics included legislative mandates and standards, control technology, activities indirectly affecting water pollution control, and an assessment of the full use of water pollution control technology. GRA

N75-21839# Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS Final Report
John R. Hyland Jun. 1974 183 p refs
(PB-238096/2; EPA-430/1-74-005) Avail: NTIS HC $7.00

A course training manual with outlines concerning the oil spill problem, prevention, control, and treatment is presented. Three outlines deal with hazardous material, five are concerning sources of the spill problem; six outlines deal with sampling and the characteristics of oil, eleven describe prevention, control and specific treatment methods, four have to do with the legislation and the legal response. References are included. Author

N75-21840# Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
ENVIRONMENTAL APPLICATIONS OF ADVANCED INSTRUMENTAL ANALYSES: ASSISTANCE PROJECTS FY 73 Environmental Protection Technology Series
Ann L. Alford Aug. 1974 41 p refs
(PB-238472/5; EPA-660/2-74-078; W75-03041) Avail: NTIS MF $2.25; SOD HC as EP1.23:6602-74-078 CSCL 13B

The cases briefly reported include: Terpenes in paper mill effluents and Mississippi River samples; organic components of pesticide plant effluents; organic compounds formed during chlorination of municipal waste sludge; organic components of dye plant effluent; organic and elemental components of coal-gasification pilot plant effluent; elemental analysis of Lake Ontario water; elemental analysis of patio debris; and elemental analysis of mineral processing plant wastes. GRA

N75-21841# Sobotka and Co., Inc., Stamford, Conn.
POLICY GUIDELINES FOR AUTOMOBILE EMISSIONS CONTROL: A REVIEW OF THE STUDY ON AIR QUALITY AND AUTOMOBILE EMISSION CONTROL BY THE NATIONAL ACADEMY OF SCIENCES Final Report
18 Nov. 1974 13 p
(Contract DOT-PS-50219)
(PB-238510/2; DOT-S-75-1) Avail: NTIS HC $3.25 CSCL 13B

The level and timing of the current NOX standards are questionable. Both should probably be relaxed. The cost savings from doing so are substantial. A single national standard for automobile emission is unjustified. Ambient air quality standards are set at the Federal level. These standards can be achieved in the least costly manner by taking advantage of the potential trade-offs between automobile emissions, auto use limitations and control of emissions from stationary sources. These trade-offs can only be made if local conditions are considered. GRA

N75-21842# Center for the Environment and Man, Inc., Hartford, Conn.
ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS Final Report
D. R. Zoellner and G. M. Northrop Mar. 1974 96 p refs
(PB-238497/2; CEM-4155-498) Avail: NTIS HC $4.75 CSCL 13B

A systematic approach to environmental profiling of Connecticut River tributary watersheds is presented for use in environmental evaluations of structural and/or nonstructural flood management alternatives, developed from selected literature reviews and visits to the contrasting Mill (MA) and Black (VT) River watersheds, typical of middle and upper basin tributary drainage areas of the Connecticut River respectively. Watershed area, steepness of slopes, type and degree of vegetative cover, and susceptibility of the region to drought and climate typically characterize Connecticut River basin watersheds and influence species diversity and ecological system productivity. GRA

N75-21843# Battelle Memorial Inst., Columbus, Ohio.
COST OF CLEAN AIR 1974 Annual Report
Apr. 1974 316 p
(Contract EPA-68-01-1538)
(PB-238762/9; EPA-230/3-74-003; AR-6) Avail: NTIS

HC $9.25 CSCL 13B

An analysis is made of the incremental cost to be borne by industry, 1971-79, to meet the standards required under the Clean Air Amendments of 1970. The report is called for under Section 312 (a) of the Clean Air Act. The contents cover: Mobile source emission control; Industrial source control costs (Fuel industries, chemical industries, metal industries, burning and incineration, quarrying and construction, and food and forest products); Fossil fuel burning sources; Pollution costs; Methods of assessing air pollution costs; Pollution cost estimates; and Comparing cost and benefit values. GRA

N75-21844# State Univ. of New York, Buffalo. Dept. of Chemistry.

ION SELECTIVE MEMBRANE ELECTRODES FOR WATER POLLUTION MONITORING Environmental Protection Technology Series

G. A. Rechnitz Aug. 1974 31 p refs

(Grant EPA-R-800991)

(PB-238490/7; W75-03048; EPA-660/2-74-079) Avail: NTIS HC $3.75; SOD HC $0.80 as EP1.23:660/2-74-079 CSCL 07D

New ion-selective electrodes were developed for several ions not previously accessible to electrode measurement. New electrode configurations were constructed and evaluated in terms of suitability for monitoring purposes. The ions include sulfate and carbonate. A liquid membrane electrode for carbonate and a solid membrane electrode for sulfate were devised. The properties of these electrodes were evaluated and found to be useful for measurements in water systems. Both micro and flow-through electrodes for a number of ions were constructed and tested. Particular success in this connection was achieved for sensors responsive to the halide and heavy metal ions. Electrodes were applied to the measurement of NTA in waters and the study of ion association. GRA

N75-21845# National Environmental Research Center, Cincinnati, Ohio.

PROMISING TECHNOLOGIES FOR TREATMENT OF HAZARDOUS WASTES Final Report, 1 Jul. 1973 - 1 Jul. 1974

Robert F. Landreth and Charles J. Rogers Nov. 1974 45 p refs

(PB-238145/7; EPA-670/2-74-088) Avail: NTIS HC $3.75 CSCL 07A

Literature searches, sitevisits, and personal communications with experts in the field provided the basis for identifying needed treatment technologies. Most hazardous waste streams are mixtures of pesticides, heavy metals, organic solvents, acids, or bases, and have a high solids concentration. Treatment processes that appear applicable for processing both homogeneous and heterogeneous hazardous waste streams include chemical, biological, and physical treatments. Recommended promising treatment techniques are: chlorinolysis, wet air oxidation, decomposition by acids and bases, chemical oxidation, other chemical treatments, biological degradation, catalysis, batch and continuous ion exchange, photochemical processing, low-temperature microwave discharge, osmosis/ultrafiltration, and activated carbon adsorption. GRA

N75-21846# Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.

INSTRUMENTAL ANALYSIS OF CHEMICAL POLLUTANTS (107) TRAINING MANUAL Final Report

Charles R. Feldmann Apr. 1974 282 p refs

(PB-238893/2; EPA-430/1-74-001) Avail: NTIS HC $8.75 CSCL 07D

This manual contains lecture and laboratory outlines dealing with the instrumental analysis of certain pollutants found in water; e.g., metals, chlorinated hydrocarbons, and organophosphorus compounds. Topics covered are sample collection and isolation, quality control, mass spectrometry, gas chromatography, infrared, emission spectroscopy, and atomic absorption. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-21847 State Univ. of New York, Albany.

INVESTIGATION OF THE TEMPORAL VARIATION OF IONOSPHERIC POTENTIAL AND ELECTRICAL STRUCTURE THROUGH THE ATMOSPHERIC EXCHANGE LAYER Ph.D. Thesis

Ralph Joseph Markson 1974 177 p

Avail: Univ. Microfilms Order No. 75-1567

The magnitude of the ionospheric potential and its temporal variation were investigated by means of airplane potential gradient soundings and extended duration constant altitude potential gradient measurements above the exchange layer. Such a measuring capability was developed in order to determine if the ionosphere is an equipotential surface. A measurement lasting one day resembled the unitary variations seen in averaged world-wide thunderstorm activity and in the averaged Carnegie potential gradient data. By comparison, one week's data are necessary to reveal the unitary pattern when ground measurements are used because sources of noise are near the earth. Results show that the ionospheric potential varies simultaneously in the Bahamas and the Gulf of Alaska, indicating that the ionosphere is an equipotential surface; and the diurnal variation of ionospheric potential has not changed in several decades. Details of space charge densities through the exchange layer were obtained over land and sea. Results indicate that organized convection of positive space charge over large areas of ocean may help the global generator maintain the ionospheric potential. Dissert. Abstr.

N75-21848 Minnesota Univ., Minneapolis.

A CLIMATOLOGICAL STUDY OF ATMOSPHERIC VENTILATION AT MINNEAPOLIS, SAINT PAUL Ph.D. Thesis

Allen Bennett Johnson 1974 205 p

Avail: Univ. Microfilms Order No. 75-2110

Atmospheric ventilation for Minneapolis-St. Paul was studied from wind and temperature data measured on a 500 foot television tower. Temperature lapse rates based on temperature differences between 70 and 500 feet were grouped into atmospheric stability categories; isothermal-inversion; subadiabatic; and superadiabatic. Each category was subdivided based upon wind speeds of less than 8 knots and greater than or equal to 8 knots. The frequency of occurrence of each class was examined according to wind direction, sky cover, time of day, time of year, and various combinations. These classes were related to the associated synoptic conditions for purposes of predicting their occurrence. Further investigation included the assessment of the capacity of the atmosphere to disperse materials. Results show that; the isothermal-inversion condition was restricted to nighttime periods when winds were less than 8 knots and skies were clear; the subadiabatic condition was a nighttime phenomenon; and the superadiabatic condition was a daytime phenomenon and dominated the early afternoon. Dissert. Abstr.

N75-21849 Ohio State Univ., Columbus.

MEAN GRAVITY ANOMALY PREDICTION FROM TERRESTRIAL GRAVITY DATA AND SATELLITE ALTIMETRY DATA Ph.D. Thesis

Glenn Nils Smith 1974 150 p

Avail: Univ. Microfilms Order No. 75-3200

The application of the statistical prediction of mean gravity anomalies from existing gravity data is considered. Prediction equations are derived and then applied to the statistical prediction of mean gravity anomalies of 1 deg and 5 deg equal area blocks. An empirical 1 deg equal covariance function is used in the calculations. The prediction of 1 deg equal area blocks from 1 deg anomaly data resulted in an indicated accuracy of approximately + or - 19 mgal where only the closest surrounding blocks were found to be of major importance. Prediction of 5 deg equal area blocks from 1 deg anomaly data resulted in indicated accuracies of approximately + or - 1 mgal to + or - 19 mgal depending upon the distribution of the data. Dissert. Abstr.

N75-21850 Texas A&M Univ., College Station.
RADIATION TRANSFER THROUGH THE EARTH'S ATMOSPHERE USING THE MATRIX OPERATOR METHOD Ph.D. Thesis
Stephen Jude Hitzfelder 1974 143 p refs
Avail: Univ. Microfilms Order No. 75-2863

The matrix operator method of solving radiation transfer problems is extended to include polarization. The reflection and transmission operators are presented with continuous variables. An explicit expression for the phase matrix for spherical particles is obtained from the Mie theory in a form applicable to the matrix operator method. The symmetry relations derived by Hovenier from symmetry arguments for the phase matrix are rigorously demonstrated. The symmetry relations for the reflection and transmission operator in both the homogeneous and inhomogeneous cases are rigorously. Intensity, polarization, and direction of polarization results are given for a conservative Rayleigh atmosphere with optical depths ranging from the very small to the semi-infinite limit. Dissert. Abstr.

N75-21851 Ohio State Univ., Columbus.
NON-GLOBAL RECOVERY OF GRAVITY ANOMALIES FROM A COMBINATION OF TERRESTRIAL AND SATELLITE ALTIMETRY DATA Ph.D. Thesis
Sivasithamparam Gopalapillai 1974 108 p
Avail: Univ. Microfilms Order No. 75-3075

A procedure for the recovery of mean gravity anomalies from satellite altimetry data is developed and tested. An indirect method, based on the use of the Stokes' formula is chosen for its flexibility in combining any a priori information available on the anomalies and in filtering out any systematic error that may be inherent in the observations. The method is tested with simulated data for the recovery of 2 deg x 2 deg and 1 deg by 1 deg anomalies. The anomalies appear to be recoverable with an accuracy of approximately 8 mgals for 2 deg x 2 deg and 19 mgals for 1 deg x 1 deg blocks from altimetry data with an accuracy of one meter. The minimum requirement for the density of observations is shown to be one per block. The performance of this procedure is dependent on the cap sizes chosen for both the Stokes' and Molodenskii formulas. The magnitude of the remote zone contributions for the formulas is evaluated for various cap sizes. Highest degree of the potential coefficients used and graphs to aid in cap selection are plotted. The minimal effect of an observation in one block on the determination of the anomalies in the neighboring blocks suggests that the cap size for the Molodenskii integral need not be more than 1 or 2 degrees for accuracy. Dissert. Abstr.

N75-21852 Ohio State Univ., Columbus.
SPECTRA OF NO, N2O, CO2 AND H2O AT 5.3 MICRONS OF INTEREST TO STUDIES OF THE EARTH'S ATMOSPHERE Ph.D. Thesis
Jerry Joseph Perrizo 1974 274 p
Avail: Univ. Microfilms Order No. 75-3167

High resolution absorption vibration-rotation spectra were obtained and molecular constants derived for the 1-0 band of the NO molecule, the 03(1)0-00(0)0 band of the CO2 molecule, and the following bands of the N2O molecule: 11(1)0-00(0)0, 12(2)0-01(1)0, 12(0)0-01(1) and 13(1)0-02(0)0. Absorption spectra of water vapor were recorded in the region 1869 to 1911/cm. In addition, band fragments of the isotopic species N-15N-14O-16, N-14N-15O-16, and (N-14)2O-18 were observed. A previously unreported Q branch believed to be due to N2O was observed in an important atmospheric window region between 1889 and 1891/cm. In addition to the above molecular studies, the research pursued involved efforts toward some technological advances in the laboratory. In particular, the ten-meter Czerny-Turner vacuum grating spectrograph was modified to permit accurate wavelength measurements at 1 micron. Dissert. Abstr.

N75-21853 Michigan Univ., Ann Arbor.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE IONIZATION EXCHANGES BETWEEN THE IONOSPHERE AND PLASMASPHERE Ph.D. Thesis
Jose Luiz Lunas de Mello Massa 1974 245 p
Avail: Univ. Microfilms Order No. 75-7442

A mathematical model which consists of the coupled continuity and momentum equation for H(+) and O(+) was developed, covering the altitude range from the F2 region to the geomagnetic equator. The boundary conditions and temperature profiles are based on measured parameters while the neutral gas densities are obtained from model atmospheres. The model was applied to the theoretical study of the flux of protons in and out of the ionosphere. The two time periods studied correspond to conditions typical of (1) a magnetically quiet 24 hour period and (2) conditions following a severe magnetic storm. Numerous reliability tests for the numerical code were performed and comparisons with results obtained from less complex models were carried out. The theoretical calculations indicate that during quiet times the nighttime downward flux from the plasmasphere, at midlatitudes, is a significant source of ionization in the upper F-region. Dissert. Abstr.

N75-21854# Eidgenossische Technische Hochschule, Zurich (Switzerland).
REGULAR OZONE SOUNDINGS AT THE AEROLOGICAL STATION OF THE SWISS METEOROLOGICAL OFFICE AT PAYERNE, SWITZERLAND, 1968-1972
H. U. Duetsch Sep. 1974 335 p ref
(LAPETH-10) Avail: NTIS HC $9.50

The results of ozone soundings are presented in tabular form and as ozonogram plots of all single ascents. Tables are presented of mean values of ozone and temperature for each of the 48 months and for 21 months of soundings including 240 ascents done previously. Averages computed from the total sounding material are given. These averages are compared in ozonogram form with the results from a concurrent sounding program. The seasonal variation of the vertical ozone distribution obtained from all soundings is discussed as related to inferred effects of ozone transport by the general circulation. The strong short term variability of ozone and correlations between ozone and temperature are discussed. Variations are strongest in the lower stratosphere and are obviously related to the large scale weather patterns. At the level of the ozone peak a clearcut biennial variation is observed during the first half of the year; close connection with 26 month oscillation of the circulation in the tropical stratosphere is indicated. Author

N75-21855*# Control Data Corp., Minneapolis, Minn. Research Div.
A FEASIBILITY STUDY FOR MEASURING STRATOSPHERIC TURBULENCE USING METRAC POSITIONING SYSTEM Final Report
K. S. Gage and W. H. Jasperson 31 Mar. 1975 91 p refs
(Contract NAS2-8400)
(NASA-CR-137675) Avail: NTIS HC $4.75 CSCL 04A

The feasibility of obtaining measurements of Lagrangian turbulence at stratospheric altitudes is demonstrated by using the METRAC System to track constant-level balloons. The basis for current estimates of diffusion coefficients are reviewed and it is pointed out that insufficient data is available upon which to base reliable estimates of vertical diffusion coefficients. It is concluded that diffusion coefficients could be directly obtained from Lagrangian turbulence measurements. The METRAC balloon tracking system is shown to possess the necessary precision in order to resolve the response of constant-level balloons to turbulence at stratospheric altitudes. A small sample of data recorded from a tropospheric tetroon flight tracked by the METRAC System is analyzed to obtain estimates of small-scale three-dimensional diffusion coefficients. It is recommended that this technique be employed to establish a climatology of diffusion coefficients and to ascertain the variation of these coefficients with altitude, season, and latitude. Author

N75-21856# Lockheed Missiles and Space Co., Palo Alto, Calif.
LOW FREQUENCY OSCILLATIONS OF THE NEUTRAL LAYER OF THE MAGNETOSPHERE TAIL
I. M. Eremin and E. I. Shkelev [1975] 8 p refs Transl. into ENGLISH from Issled. po Geomagn., Aeron. i Fiz. Solntsa (Irkutsk), no. 34, 1974 p 34-41
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The natural oscillations of the neutral layer of earth's magnetosphere tail are examined on the basis of a hydrodynamic approximation. Dispersion relations are obtained and investigated

for the cases when the disturbance is propagated in and perpendicular to the equilibrium magnetic field direction. Author

N75-21857# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EXCITATION OF ALFVEN WAVES IN THE MAGNETOSPHERE BY A MOVING SOURCE
N. A. Zolotukhina [1975] 5 p refs Transl. into ENGLISH from Issled. po Geomagn. Aeron. Fiz. Solntsa (Irkutsk), no. 34, 1974 p 20-23
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

A simple model is used to compute Cerenkov excitation of Alfven waves by a secondary linear source moving uniformly perpendicularly to the external magnetic field. In contrast to magnetosonic waves which are excited only for V = A in a cold plasma, the Alfven waves are excited for an arbitrarily low source velocity V (A is the Alfven velocity). This permits the assumption that generation of Alfven waves originate in the magnetosphere during azimuthal drift of inhomogeneities of energy particle distributions. Author

N75-21858# Joint Publications Research Service, Arlington, Va.
GRAVIMETER PENDULUM MOTION STABILITY
V. A. Kuzivanov and Yu. N. Smirnov 27 Mar. 1975 8 p refs Transl. into ENGLISH from Dokl. Akad Nauk SSSR (USSR), v. 217, no. 3, 1974 p 558-560
(JPRS-64416) Avail: NTIS HC $3.25

The stability of a marine gravimeter under the effects of inertial acceleration is analyzed by considering parametric resonance oscillations in a strongly damped pendulum whose position is close to the horizontal. G.G.

N75-21859# Joint Publications Research Service, Arlington, Va.
NEW INTERPRETATION OF GEOID UNDULATIONS AT SEA
Yu. A. Tarakanov and L. P. Vinnik 9 Apr. 1975 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow) Izdatel'stvo Nauka, v. 220, no. 2, 1975 p 339-341
(JPRS-64514) Avail: NTIS HC $3.25

An interpretation of the use of the differential method, based on the treatment of gravity anomalies as vector values, for determining the coordinates of the center of an excessive mass is given. Author

N75-21860*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUANTITATIVE MODELS OF MAGNETIC AND ELECTRIC FIELDS IN THE MAGNETOSPHERE
David P. Stern Apr. 1975 19 p Presented at the Tropical Conf. on Quantitative Magnetospheric Models, La Jolla, Calif., 6-8 May 1975
(NASA-TM-X-70875; X-602-75-90) Avail: NTIS HC $3.25 CSCL 04A

In order to represent the magnetic field B in the magnetosphere various auxiliary functions can be used: the current density, the scalar potential, toroidal and poloidal potentials, and Euler potentials -- or else, the components of B may be expanded directly. The most versatile among the linear representations is the one based on toroidal and poloidal potentials; it has seen relatively little use in the past but appears to be the most promising one for future work. Other classifications of models include simple testbed models vs. comprehensive ones and analytical vs. numerical representations. The electric field E in the magnetosphere is generally assumed to vary only slowly and to be orthogonal to B, allowing the use of a scalar potential which may be deduced from observations in the ionosphere, from the shape of the plasmapause, or from particle observations in synchronous orbits. Author

N75-21861# Danish Meteorological Inst., Copenhagen.
RUDE SKOV GEOPHYSICAL OBSERVATORY MAGNETIC RESULTS, 1971
1974 36 p
(ISBN-87-7478-102-2) Avail: NTIS HC $3.75

Tables of hourly means, extreme values, and ranges of H, D, and Z as well as K- and C-indicies of magnetic activity are presented. Mean diurnal inequalities of H, D, and Z are included. E.H.W.

N75-21862*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
ATLAS OF RADIATION BUDGET MEASUREMENTS FROM SATELLITES, 1962 - 1970
Thomas H. VonDerHaar and James S. Ellis Dec. 1974 193 p refs
(Grant NGR-06-002-102)
(NASA-CR-142676; Paper-231) Avail: NTIS HC $7.00 CSCL 04A

Radiation budget data measured at the top of the atmosphere by earth-orbiting satellites for various time periods in the years 1962 through 1970 are presented in the form of contoured maps which were derived from 5 seasonal and 25 monthly and semimonthly data sets. The data are values of planetary albedo, infrared radiant exitance, absorbed solar energy, net radiation balance. Documentation and contoured maps are included together with data tabulation at each 10 deg latitude and longitude. Additional data published by other authors are referenced. Author

N75-21863# CER Geonuclear Corp., Las Vegas, Nev.
SEISMIC EFFECTS PROGRAMS, PROJECT RIO BLANCO
21 Oct. 1974 52 p refs Sponsored by ERDA
(PNE-RB-64) Avail: NTIS HC $4.25

These programs include: a seismic array to monitor the ground motion resulting from the detonation at distances varying from 3.7 miles to 93 miles from the emplacement well (EW); two seismic arrays to detect the aftershocks of the detonation and to locate the hypocenters of these aftershocks; a seismic array to study the correlation of structural damage to low-level ground motion; a seismic array to study structural response to the ground motion; a seismic array to monitor the ground spall caused by the detonation; an instrumental array to monitor changes in pore pressure resulting from the seismic wave; a structural bracing program to minimize the damage caused by the ground motion; and a pre- and postdetonation inspection of selected bridges in the area to detect any change due to ground motion. NSA

N75-21864# Weapons Research Establishment, Salisbury (Australia).
EVIDENCE OF FRONTAL STRUCTURES IN NONBLANKETING SPORADIC-E LAYERS
R. H. Clarke Mar. 1974 12 p refs
(WRE-TN-A-249(AP)) Avail: ERDA Depository Libraries HC $4.00

Radiowave-sounding techniques were refined in order to examine the structure of partially transparent sporadic E layers. A hf interferometer was developed to provide angle-of-arrival data on occasions when the downcoming signal arrives from a reasonable well-defined direction. It is shown that a sporadic E layer is comprised of three frontal clouds, each aligned in a north-south direction though possessing different peak electron concentrations. An ionosonde was adapted to record ordinary and extraordinary mode traces on alternate ionograms. A ninety-minute sequence of such ionograms recorded in rapid succession indicates that the observed temporal variations in the ordinary and extraordinary modes blanketing and critical frequencies of the sporadic E layer were caused by the horizontal movement of frontal over dense clouds of ionization.
Author (NSA)

N75-21865# California Univ., Livermore. Lawrence Livermore Lab.
PHYSICAL EXPLANATION OF ELECTROMAGNETIC SURFACE WAVE FORMULAS
R. J. Lytle and E. K. Miller 3 Oct. 1974 16 p refs
(Contract W-7405-eng-48)
(UCRL-51654) Avail: NTIS HC $3.25

The behavior of electromagnetic surface waves generated by both elevated and buried sources is explained by physical reasoning, with mathematical formulas describing the physical processes. All combinations of source and receiver orientations are considered. Applications of generalized surface wave formulas for mixed-path and spatially-varying terrains are discussed. The generalized surface wave formulas for buried sources are validated

by evaluation of Sommerfeld integrals. These formulas are applicable over a wider range than previous approximate surface wave formulas. Author (NSA)

N75-21866# Analysis and Computer Systems, Inc., Burlington, Mass.
DATA PROCESSING OF SPHERICAL ELECTROSTATIC ANALYZER (SEA) EXPERIMENTS FLOWN ON INJUN-5 AND ISIS-1 SATELLITES Final Report, 1 Apr. - 30 Nov. 1973
James R. Delaney 10 Mar. 1974 23 p
(Contract F19628-73-C-0215; AF Proj. 8617)
(AD-A002325; AFCRL-TR-74-0132) Avail: NTIS CSCL 04/1

This report contains the program modifications implemented to complete the standard data processing of the INJUN-V and ISIS-I Spherical Electrostatic Analyzer (SEA) experiments. Also included are production statistics and a summary of problem acquisitions which could not be processed. Approximately 2,000 digitized data tapes were processed. GRA

N75-21867# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
ENERGETIC PROTONS IN THE KeV ENERGY RANGE AND ASSOCIATED KeV ELECTRONS OBSERVED AT VARIOUS LOCAL TIMES AND DISTURBANCE LEVELS IN THE UPPER IONOSPHERE
Bengt Hultqvist, Hans Borg, Peter Christophersen, Willi Riedler, and William Bernstein Jan. 1974 158 p refs Prepared in cooperation with Kiruna Geophys. Obs.
(COM-75-50058/7; NOAA-TR-ERL-305-SEL-29) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL-305-SEL-29 CSCL 04A

The KeV proton measurements on board the near-earth polar-orbiting satellites ESRO IA and IB are analyzed and discussed in relation to simultaneously obtained KeV electron data. Data are presented for all local times and for low, medium, and high K sup p values. Some of the conclusions about the physical processes affecting the deV auroral particles that can be drawn on the basis of the observational results are given. GRA

N75-21868# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
A 1964 DIGITAL DATA BASE FOR IONOSPHERIC MODELING. PART A: BOTTOMSIDE ELECTRON DENSITY PROFILES
G. Goe, G. M. Lerfald, and R. B. Jurgens Oct. 1974 41 p refs
(COM-75-10075/0; NOAA-TM-ERL-SEL-35; NOAA-74121116) Avail: NTIS HC $3.75 CSCL 04A

Approximately 30,000 film ionograms recorded at ground-based ionospheric sounding stations during 1964 were selected for a pilot study to obtain true height profiles of electron density. A yield of 18,226 interpolated profiles was obtained using a new analysis system developed to automate as far as possible all of the digitizing and data processing steps but to retain the pattern recognition capabilities of a human in scaling the ionograms. The profiles of electron density extend from 90 km up to the height of the peak of the F-layer. One of the features of these profiles is that each is started using the same method. GRA

N75-21869# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
THE SOURCES AND SINKS OF WATER VAPOR IN THE STRATOSPHERE
Helmut K. Weickmann and Charles C. VanValin Oct. 1974 38 p refs
(COM-75-50050/4; NOAA-TR-ERL-307-APCL-32; NOAA-74121604) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL 307-APCL32.020020 CSCL 04A

The average water vapor concentration in the lower stratosphere is about 2.5 ppmm according to the most reliable measurements. There is an average annual north-to-south gradient of less than 0.5 ppmm, a maximum mixing ratio over the Intertropical Convergence Zone (ITCZ) of the 3 to 4.5 ppmm, and an increase of about 50 percent in the mixing ratio with increasing altitude up to the stratopause. The mother-of-pearl clouds occasionally observed in high latitudes are evidence that higher mixing ratios sometimes occur. Removal of straospheric moisture during the polar night by the formation of ice particles is the only sink mechanism which is specific for water vapor. The north-to-south gradient in stratospheric water vapor is due to the lower temperatures and the resulting greater effectiveness of the Antarctic sink. GRA

N75-21870# Naval Research Lab., Washington, D.C.
RESEARCH AT NRL ON THEORETICAL AND NUMERICAL SIMULATION STUDIES OF IONOSPHERIC IRREGULARITIES Interim Report
S. I. Ossakow Oct. 1974 47 p refs
(NRL Proj. H02-27; NRL Proj. A03-16-101)
(AD-A002930; NRL-MR-2907) Avail: NTIS CSCL 04/1

The importance of ionospheric irregularities in the overall concept of dynamic ionospheric physics modeling is emphasized. In particular, ionospheric irregularities produce scintillation which causes communication and radar system degradation. The determination, classification and nonlinear development of such instabilities, in terms of theoretical and numerical studies, is of fundamental importance. This report gives an overview of ionospheric irregularities and specific results in two areas: (1) nonlinear development of the type II E region equatorial electrojet instability and (2) plasma clouds, image effects and striations in the ionosphere. GRA

N75-21871# Army Foreign Science and Technology Center, Charlottesville, Va.
DEVELOPMENT TRENDS IN GEODESY AND TOPOGRAPHY
I. A. Kutuzov 28 Mar. 1974 10 p Transl. into ENGLISH from Geod. i Kartografiya (USSR), no. 12, 1972 p. 1-4
(AD-A002759; FSTC-HT-23-0212-74) Avail: NTIS CSCL 08/5

The report discusses trends in geodesy and topography on the approach of the 50th anniversary of the U.S.S.R.. In the future there will be an increase of automation and the use of computers will bring about more accurate and timely production. GRA

N75-21872# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN ANALYSIS OF POLAR CAP BACKSCATTER RADAR DATA Air Force Surveys in Geophysics
Terence J. Elkins 16 Sep. 1974 21 p refs
(AF Proj. 5631)
(AD-A003346; AFCRL-AFSG-293; AFCRL-TR-74-0457) Avail: NTIS CSCL 04/1

A simplified analysis was performed as a preliminary to a more elaborate analysis of data from an FM/CW backscatter sounder experiment known as RECAP in the polar winter ionosphere. The results show that a reasonably accurate simulation of ionogram data can be achieved with the simple procedure and these results are of value in themselves. A brief survey of the morphology of the polar winter ionosphere is included as an aid to further data interpretation. Particular attention was paid to the question of clutter, and a model for the different kinds thereof is presented. The suggestion that active control of the antenna radiation pattern may be used to mitigate against clutter degradation in an OTH backscatter radar was examined and found to have merit. Finally, the question of the observed signal strength characteristics was addressed and a model for non-deviative absorption is presented. GRA

N75-21873# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE D- AND E- REGIONS Environmental Research Papers
William Swider 12 Sep. 1974 23 p refs
(AF Proj. 6690)
(AD-A003386; AFCRL-ERP-488; AFCRL-TR-74-0493) Avail: NTIS CSCL 04/1

The chemistry of the E-region is fairly well understood and even many of the dynamical complications of this region have been successfully modeled on individual bases. Some of the major remaining problems of this region are discussed, in particular the nitric oxide concentration, a gas affecting the ratio of the two major E-region ions, O2(+) and NO(+). The D-region is much simpler than the E-region from a dynamical point of view but extremely much more complex from a chemical standpoint.

Recent results from a study of the D-region under bombardment by solar protons is emphasized. GRA

N75-21874# Aerospace Corp., El Segundo, Calif. Lab. Operations.
EFFECT OF DRIFT-RESONANCE BROADENING ON RADIAL DIFFUSION IN THE MAGNETOSPHERE Interim Report
Michael Schulz 15 Nov. 1974 13 p refs
(Contract F04701-74-C-0075)
(AD-A003402; TR-0075(5260-20)-3; SAMSO-TR-74-245) Avail: NTIS CSCL 04/1

The purpose of this work is to address a conceptual problem inherent in the theory of magnetospheric radial diffusion. In the usual formulation (e.g., Falthammar, 1968), one considers the radiation belts to be immersed in randomly fluctuating electrostatic and electromagnetic fields (superimposed on the earth's time-averaged B field). The fluctuations are considered adiabatic on the gyration and bounce time scales, but describable by smooth spectra that are nonvanishing at the particle drift frequency (Omega sub 3)/2 pi. The radial-diffusion coefficient (D sub LL) is then proportional to the spectral density at omega = (Omega sub 3). GRA

N75-21875# Aerospace Research, Inc., Boston, Mass.
BLACK BRANT 4 A ROCKET PROBE RECEIVER EXPERIMENT Final Report, 1 Jul. 1972 - 31 Dec. 1973
Wayne O. Miller Feb. 1974 27 p
(Contract F19628-72-C-0340; AF Proj. 4603)
(AD-A003356; Pub-534; AFCRL-TR-74-0237) Avail: NTIS CSCL 04/1

The report describes the design, fabrication, test, and launch of two rocket probe receiver packages to measure the propagation of ELF and VLF signals in the ionosphere. The second phase of the program included the study and design of a miniaturized receiver package to be electrically the same but with physical and environmental characteristics of an ARCAS meteorological rocket. The results of the program, including the trip report, are summarized. GRA

N75-21876# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PERIODIC OSCILLATIONS IN THE STRATOSPHERE AND MESOSPHERE
Allen E. Cole and Arthur J. Kantor 8 Oct. 1974 18 p refs
(AF Proj. 8624)
(AD-A003396; AFCRL-ERP-490; AFCRL-TR-74-0504) Avail: NTIS CSCL 04/1

Periodic fluctuations in the annual temperature and density distributions based on rocket observations at heights between 30 to 90 km are presented in terms of amplitude and phase as a function of height and latitude. The phases of the semi-annual components in arctic and subarctic regions are markedly different at levels in the upper stratosphere if the analyses are based on monthly medians rather than monthly means. Means and medians are considerably different at these altitudes during the winter months in this region due to stratospheric and mesospheric warmings. GRA

N75-21877# Lowell Technological Inst. Research Foundation, Mass.
DIGISONDE OPERATION AT MAYNARD, MASSACHUSETTS Final Report, 1 Oct. 1973 - 30 Jun. 1974
Klaus Bibl, Bodo W. Reinisch, Sheryl Smith, and Robert K. Temple Oct. 1974 13 p refs
(Contract F19628-74-C-0063; AF Proj. 5631)
(AD-A003401; LTIRF-369-IP; AFCRL-TR-74-0523) Avail: NTIS CSCL 04/1

Routine maintenance and calibration of the Digisonde system in Maynard, Massachusetts was performed during the period from 1 October 1973 to 30 June 1974. Power line fluctuations caused a series of shutdowns of the old C-4 transmitter used as power amplifier. Reliability of the system improved after installation of a modified Granger amplifier. The station presently uses the Granger intermediate amplifier feeding 500 W peak power (10 W average) to the transmitting rhombic antenna. GRA

N75-21878# Massachusetts Univ., Amherst. Astronomy Research Facility.
INFRARED SPECTROSCOPIC STUDIES OF LOW PRESSURE ELECTRONICS DISCHARGES Final Report, 15 Jan. 1973 - 14 Apr. 1974
John Strong, P. Hansen, Kurt L. Wray (Physical Sciences, Inc.), and George E. Caledonia (Physical Sciences, Inc.) 25 Nov. 1974 21 p refs
(Contract DNA001-73-C-0143; DARPA Order 1433)
(AD-A003010; UMASS-ARF-74-286; DNA-3433F) Avail: NTIS CSCL 07/4

Emission spectra of low pressure, large volume electronic discharges in air, oxygen, and nitrogen are described. Problems arising from an attempt to observe excited ozone at 9.6 micrometers are discussed in detail. Sample spectra in the 2 micrometers wavelength are presented. GRA

N75-21879# Battelle Columbus Labs., Onio.
CHEMICAL CHARACTERIZATION OF MODEL AEROSOLS Final Report, Jun. 1972 - Jun. 1974
Warren Schwartz, Peter W. Jones, Charles J. Riggle, and David F. Miller Aug. 1974 142 p refs
(Grant EPA-R-801174)
(PB-238557/3; EPA-620/3-74-011) Avail: NTIS HC $5.75 CSCL 07E

Model aerosols were generated from individual hydrocarbon precursors and nitrogen oxides under simulated atmospheric conditions in a 17.3 cu m environmental chamber. Aerosols were collected on glass fiber filters and organic matter was obtained by solvent extraction. Organic reaction products were analyzed in detail by techniques including gas chromatography and gas chromatography combined with mass spectrometry. The study also included evaluation of techniques for selective derivatization of aerosol products. A variety of polyfunctional reaction products were identified. GRA

N75-21694 Joint Publications Research Service, Arlington, Va.
TEMPERATURE FLUCTUATIONS AS A SOURCE OF ENERGY FOR ATMOSPHERIC MOVEMENTS
M. I. Yudin, K. V. Pyatygina, E. A. Komorina, and A. Yu. Shtern *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 1-13 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 3-12 (For availability see N75-21693 13-42)

N75-21697 Joint Publications Research Service, Arlington, Va.
STATISTICAL RELATION OF THE VERTICAL TRANSPARENCY OF THE ATMOSPHERE TO THE METEOROLOGICAL PARAMETER
Ye. M. Sokolov, L. T. Matveyev, and V. D. Budovyy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 31-41 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 28-35 (For availability see N75-21693 13-42)

N75-21698 Joint Publications Research Service, Arlington, Va.
VARIABILITY OF THE ATMOSPHERIC TRANSPARENCY COEFFICIENT
G. M. Abakumova, T. V. Yevnevich, and Z. P. Semenova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 42-50 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 36-41 (For availability see N75-21693 13-42)

N75-21699 Joint Publications Research Service, Arlington, Va.
CALCULATING THE EFFECT OF VARIOUS FACTORS ON THE EQUILIBRIUM DISTRIBUTION OF OZONE IN THE EARTH'S ATMOSPHERE
A. V. Artemyev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 51-58 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 42-47 (For availability see N75-21693 13-42)

N75-21707 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL SPECTRA OF THE PREDICTABILITY OF ATMOSPHERIC MOVEMENTS
M. S. Fuks-Rabinovich *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 121-125 refs Transl.

into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 97-99 (For availability see N75-21693 13-42)

N75-21708 Joint Publications Research Service, Arlington, Va.
SOME PECULIARITIES OF THE SPATIAL DISTRIBUTION AND TIME VARIABILITY OF ATMOSPHERIC PRESSURE IN THE EQUATORIAL PART OF THE ANTARCTIC
R. R. Belevin *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 126-130 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 99-102 (For availability see N75-21693 13-42)

N75-21709 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE ORIGIN OF CONDENSATION PROCESSES IN THE ATMOSPHERE BY THE REFLECTED LASER SIGNALS
A. Ye. Tyabotov, V. I. Shlyakhovi, and A. B. Shupyatskiy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 131-134 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 102-104 (For availability see N75-21693 13-42)

N75-21712 Joint Publications Research Service, Arlington, Va.
NONUNIFORMITY OF THE EARTH'S ROTATION AS THE INTEGRAL CHARACTERISTIC OF THE INTENSITY OF THE PLANETARY ATMOSPHERIC CIRCULATION
N. S. Sidorenkov *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 149-150 Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 112-113 (For availability see N75-21693 13-42)

N75-22260* Kanner (Leo) Associates, Redwood City, Calif.
THE COLORS OF SPACE
K. Kondratyev, A. Nikolayev, and V. Sevastyanov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 51-56 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 51-55 (For availability see N75-22255 13-99)
CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-21880 Missouri Univ., Columbia.
NUMERICAL ANALYSIS OF KINETIC ENERGY SOURCES IN LARGE SCALE TROPICAL DISTURBANCES Ph.D. Thesis
Lester Paul Merritt 1974 189 p
Avail: Univ. Microfilms Order No. 75-5770

The data consist of aerological soundings of the tropical atmosphere obtained from a 12 station network during the 1958 atomic test series carried out under Operation Hardtack in the Marshall Islands region. In order to evaluate the kinetic energy sources, and in particular the conversion between geopotential and kinetic energy, an objective analysis scheme for determining vertical motions by the kinematic method is developed. This scheme employs exact and least square approximating polynomials in multiple arrays to generate 24 alternative vertical p-velocity (omega) profiles for each location in a 24 location combined station-grid network. From these profiles, the optimum omega profile is selected on the basis of mass continuity and other objective criteria without recourse to arbitrary correction schemes. Dissert. Abstr.

N75-21881 Cornell Univ., Ithaca, N.Y.
A NATIONAL FIRE WEATHER FORECASTING SYSTEM FOR THE FORESTS OF CANADA Ph.D. Thesis
Peter Montgomery Paul 1974 442 p
Avail: Univ. Microfilms Order No. 75-6747

A national fire weather forecasting system for Canada, which facilitates the rapid dissemination of pertinent information necessary for fire control, is discussed. The system is concerned with acquiring current weather as well as predicting future weather. The forecasting procedure is composed of a routine daily forecast and the special forecast in the event of going fires. The subjects considered are: (1) the proposed organization of the forecasting service, (2) the requirements for a properly operating forecast system, (3) methods for making the requirements more understandable, and (4) suggested improvements in fire weather forecasting. Dissert. Abstr.

N75-21882# National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Atmospheric Administration.
CHARACTERISTIC OF THE LOWER ATMOSPHERE NEAR SAIPAN, 29 APRIL TO 16 MAY 1945
Joshua Z. Holland Apr. 1975 34 p refs
(NOAA-TM-EDS-CEDDA-2) Avail: NTIS HC $3.75

The meteorological part of a World War 2 investigation of the performance of a U.S. Army search radar located on Saipan in the Marianas Islands is presented. Thirty detailed temperature and humidity soundings of the lowest 10,000 ft over the ocean were made with a mercurial psychrometer aboard a PBY flying boat. The data are analyzed to show typical characteristics of the vertical structure. The existence of a layer of strong gradient of M between the lowest level sampled and the surface is inferred. A layer of nearly constant potential temperature and mixing ratio is generally found extending up to an altitude that averages 1,700 ft and ranges from 1,000 to 2,600 ft. This moist stirred layer is generally topped by a stable transition layer. Above this a drier layer with a temperature lapse rate between dry and moist adiabatic, containing cumulus clouds, extends up to a second stable layer, the trade inversion. Author

N75-21883# Commission of the European Communities, Ispra (Italy). Joint Nuclear Research Center.
THE 15TH METEOROLOGICAL YEARBOOK, 1973
G. Bollini, A. Galva, C. Gandino, and E. Maranzana 1974 62 p refs In ITALIAN
(EUR-5171-I) Avail: ERDA Depository Libraries HC $6.25, UK BF 85

The methods for measuring and elaborating atmospheric phenomena are described along with tables and graphics for the meteorological year 1973. Author (NSA)

N75-21884# Naval Weather Service Command, Washington, D.C.
WORLD WIDE AIRFIELD SUMMARIES, VOLUME 2, PART 1: MIDDLE EAST
May 1974 324 p refs Revised
(AD-A002162) Avail: NTIS CSCL 04/2

The volume provides climatological summaries for airfields and climatic areas in the Middle East. Summaries are arranged according to numbered climatic areas, and by increasing WMO station index numbers within the climatic areas. An arbitrary station number is used where WMO index numbers are not assigned. Maps are included to delineate areas and station locations. GRA

N75-21885# Naval Weather Service Command, Washington, D.C.
WORLD WIDE AIRFIELD SUMMARIES, VOLUME 2, PART 2: MIDDLE EAST
May 1974 393 p Revised
(AD-A002163) Avail: NTIS CSCL 04/2
For abstract, see N75-21884.

N75-21886# Kaysam Corp. of America, Paterson, N.J.
PRODUCTION ENGINEERING MEASURE FOR MANUFACTURE OF METEOROLOGICAL BALLOONS TYPE ML-566(XE3)/AM Quarterly Progress Report, 1 Aug. - 31 Oct. 1974
John Kantor Nov. 1974 33 p refs
(Contract DAAB07-74-C-0329)
(AD-A002684; QPR-2) Avail: NTIS CSCL 04/2

The object of this Contract is to establish the capability of producing ML-566 (XE3)/AM meteorological balloons on a pilot-line basis. Work performed during the reporting period is discussed. GRA

N75-21887# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 16102 LITTLE JOHN MISSILE NOS. 3108/3124 ROUND NOS. 717 RM/718 RM Meteorological Data Report
Nov. 1974 29 p
(DA Proj. 1T6-65702-D-127)
(AD-A003259; DR-867) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 16102 Little John, Missile Numbers 3108/3124, Round Numbers 717 RM/718 RM, are presented in tabular form. GRA

N75-21888# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex. Atmospheric Sciences Lab.
THE 16102 LITTLE JOHN MISSILE NO. 3101, ROUND NO. 716 RM, 4 NOVEMBER 1974 Meteorological Data Report
Nov. 1974 17 p
(DA Proj. 1T6-65702-D-127)
(AD-A003258; DR-866) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 16102 Little John, Missile Number 3101, Round Number 716 RM, are presented in tabular form. GRA

N75-21889# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14801 LANCE MISSILE NO. 238 APT 25 (25 JULY 1974) Meteorological Data Report
Jul. 1974 36 p
(DA Proj. 1T6-65702-D-127)
(AD-A003238; DR-857) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14801 Lance, Missile Number 2214, Round Number 238 APT, are presented in tabular form. GRA

N75-21890# National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF MICROWAVE HYGROMETER MODEL 3 Progress Report
Daniel P. Stokesberry and Saburo Hasegawa Sep. 1974 15 p ref Sponsored in part by Naval Air Systems Command
(COM-74-11765/6; NBSIR-74-578) Avail: NTIS HC $3.25 CSCL 04B

The report is a progress report on the design and construction of NBS microwave hygrometer, Model III. The hygrometer is intended for field or laboratory operation with a dew point range of -40 to 40 C. GRA

N75-21891# National Weather Service, Silver Spring, Md. Ocean Services Div.
GREAT LAKES ICE FORECASTING
C. Robert Snider Jul. 1974 113 p refs
(COM-75-10036/2; NOAA-TM-NWS-CDS-1;
NOAA-74111211) Avail: NTIS HC $5.25 CSCL 08L

Technical procedures implemented during an intensified Great Lakes marine weather and ice forecasting effort are presented along with samples of graphic and written weather and ice forecast products provided daily by the Detroit NWS Forecast Office. GRA

N75-21892# National Weather Service, Kansas City, Mo.
SUMMER RADAR ECHO DISTRIBUTION AROUND LIMON, COLORADO
Thomas D. Karr and Ronald L. Wooten Nov. 1974 24 p refs
(COM-75-10076/8; NOAA-TM-NWS-CR-57;
NOAA-74120906) Avail: NTIS HC $3.25 CSCL 04B

Radar echoes for the area within 125 n.m. of Limon, Colorado for the summer (June-August) months of 1971 and 1972 are examined for diurnal characteristics and relationships to the terrain. GRA

N75-21893# National Weather Service, Garden City, N.Y.
AN ANALYSIS OF FORECASTER'S PROPENSITIES IN MAXIMUM/MINIMUM TEMPERATURE FORECASTS
I. Randy Racer May 1974 12 p ref
(COM-75-10063/6; NOAA-TM-NWS-ER-58; NOAA-74121702)
Avail: NTIS HC $3.25 CSCL 04B

An investigation was made of an objective model used in measuring a forecaster's subjectiveness as indicators derived from forecast and observed maximum/minimum temperatures based on the FP/NMC Verification Data Tabulation. When computed and plotted over a substantial period of time, subjective forecasting patterns become more obvious and heuristic in nature. GRA

N75-21894# National Weather Service, Fort Worth, Tex.
DYNAMICS OF COLD SEASON PRECIPITATION IN THE SOUTHWESTERN UNITED STATES
Samuel L. Shaw and Boyd P. White Nov. 1974 15 p refs
(COM-75-10085/9; NOAA-TM-NWS-SR-78;
NOAA-74120907) Avail: NTIS HC $3.25 CSCL 04B

The percentage frequency and spatial distribution of cold season precipitation in New Mexico during the 1972 to 73 fall, winter, and spring season are related to the intensity and path of 500 mb vorticity maxima for twelve-hour periods after Younkin. Although parameters describing the circulation characteristics near the surface and at 500 mb were not averaged over a set of grid points for these events as in Younkin's study, close examination of individual disturbances strongly supports his models. The climatological network of observation stations over Southern Colorado and New Mexico were used to better define the distribution of cold season precipitation. If favorable convergence of air near the surface does not exist or develop, precipitation may be localized only. GRA

N75-21895# National Oceanic and Atmospheric Administration, Washington, D.C. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL EAST COAST WINTER STORMS OPERATIONS PLAN
Oct. 1974 102 p
(COM-75-10077/6; FCM-74-8) Avail: NTIS HC $5.25 CSCL 04B

The operations plan was designed to furnish weather observations for use in predicting and providing adequate and timely warnings of severe and crippling winter storms along the U.S. east coast. Separate treatment is divided as follows: responsibilities of cooperating agencies; definitions; forecasts and warnings; aircraft reconnaissance; storm situation reconnaissance track; Air Force track; Navy reconnaissance track; standard reconnaissance code; dropsonde code; winter storm plan of the day format; observations; radar observing station network; procedures for detailing National Weather Service meteorologists to FAA Air Route Traffic Control Centers; and communications. GRA

N75-21896# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
RADIATION SENSOR COMPARISONS DURING THE GATE INTERNATIONAL SEA TRIALS (GIST)
Kirby J. Hanson Apr. 1974 36 p refs Repr. from Bull. of Am. Meteorological Soc., v. 55, no. 4, Apr. 1974
(COM-75-50060/3; NOAA-TR-ERL-301-AMOL-14;
NOAA-74082007) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL301-AOML-14 CSCL 04B

Radiation sensors on two ships of the U.S.S.R., one of Mexico, and one of the U.S. were compared during the GATE International Sea Trials (GIST), 2-10 August 1973, near 20N, 60W. Pyranometer comparison showed that two instruments disagreed by 23%, but the remaining four pyranometers disagreed by less than 6%. The data also suggest the Yanishevsky and Epply pyranometers have dissimilar cosine response characteristics which causes them to disagree by 4 mW/sq cm or less at low sun elevation angles. Pyrheliometers on the four ships were in agreement to within 1.7%. Two pyrgeometers differed by only 1.3%. An analysis of the GIST data suggests that, if conditions during the main field experiment are the same as in GIST, the three-day comparison period should be sufficient to reduce random errors in pyranometer measurements to 0.8%. GRA

N75-21897# Notre Dame Univ., Ind. Dept. of Civil Engineering.
TORNADO PHOTOGRAPHIC ANALYSIS Final Report
Bruce J. Morgan Jul. 1974 50 p refs
(Grants NOAA-04-4-022-8; NOAA-04-3-022-32)
(COM-75-10117/0; NOAA-74123110) Avail: NTIS HC $3.75 CSCL 04B

Field tracking data obtained from photographic documentation of a severe storm system which produced a large tornado in

Oklahoma are presented. Recommendations are made concerning what procedures should be used in the future to achieve maximum data from severe weather photography. GRA

N75-21898# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14806 LANCE MISSILE NO. 2226, ROUND NO. 247 APT (24 OCTOBER 1974) Meteorological Data Report
Oct. 1974 54 p
(DA Proj. 1T6-65702-D-127)
(AD-A003198; DR-864) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14806 Lance, Missile Number 2226, Round Number 247 APT, are presented in tabular form. GRA

N75-21899# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12805 LANCE MISSILE NO. 2193, ROUND NO. 251 RSL (26 NOVEMBER 1974) Meteorological Data Report
Nov. 1974 38 p
(DA Proj. 1T6-65702-D-127)
(AD-A003197; DR-870) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 12805 Lanke, Missile Number 2193, Round Number 251 RSL, are presented in tabular form. GRA

N75-21900# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14802 LANCE MISSILE NO. 2612, ROUND NO. 250 APT (15 NOVEMBER 1974) Meteorological Data Report
Nov. 1974 39 p
(DA Proj. 1T6-65702-D-127)
(AD-A003196; DR-869) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14802 Lance, Missile Number 2612, Round Number 250 APT, are presented in tabular form. GRA

N75-21901# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14803 LANCE MISSILE NOS. 2598/2599 ROUND NOS. 248 APT/249 APT (15 NOVEMBER 1974) Meteorological Data Report
Nov. 1974 47 p
(DA Proj. 1T6-65702-D-127)
(AD-A003195; DR-868) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14803 Lance, Missile Numbers 2598/2599, Round Numbers 248 APT/249 APT, are presented in tabular form. GRA

N75-21902# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14808/14807 LANCE MISSILE NOS. 2984/2987 ROUND NUMBERS 256 APT/257 APT (6 DECEMBER 1974) Meteorological Data Report
Dec. 1974 35 p
(DA Proj. 1T6-65702-D-127)
(AD-A003194; DR-874) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14808/14807 Lance, Missile Numbers 2984/2987, Round Numbers 256 APT/257 APT, are presented in tabular form. GRA

N75-21903# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12808 LANCE, MISSILE NO. 2220, ROUND NO. 237 APT (25 JULY 1974) Meteorological Data Report
Jul. 1974 37 p
(DA Proj. 1T6-65702-D-127)
(AD-A003202; DR-856) Avail: NTIS CSCL 04B
Meteorological data gathered for the launching of 12808 Lance, Missile Number 2220, Round Number 237 APT, are presented in tabular form. GRA

N75-21904# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 2900, ROUND NO. 239 RSL (1 OCTOBER 1974) Meteorological Data Report
Oct. 1974 40 p
(DA Proj. 1T6-65702-D-127)
(AD-A003199; DR-859) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 11602 Lance, Missile Number 2900, Round Number 239 RSL, are presented in tabular form. GRA

N75-21905# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14801 LANCE, MISSILE NOS. 2224/2228, ROUND NOS. 240 APT/241 APT (3 OCTOBER 1974) Meteorological Data Report
Oct. 1974 47 p
(DA Proj. 1T6-65702-D-127)
(AD-A003203; DR-860) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 14801 Lance, Missile Numbers 224/2228, Round Number 240 APT/241 APT, are presented in tabular form. Author

N75-21906# Army Engineer Topographic Labs., Fort Belvoir, Va.
WORLD AREAS WITH HIGHER TEMPERATURES THAN THE YUMA PROVING GROUND DURING SUMMER. (NOTE 2 OF "STUDIES TO AID TECOM IN ANALYSES OF ENVIRONMENTAL RISKS TO MATERIALS"
Howard L. Ohman Aug. 1974 24 p
(DA Proj. 1T1-62112-A-528)
(AD-A003247) Avail: NTIS CSCL 04/2
Extensive areas of North Africa and Southwest Asia have warmest month mean maximum temperatures higher than the mean maximum temperatures for Yuma Proving Ground (YPG) during the five-month summer testing period. The areas of exceedance are substantially more widespread when determined by comparison with a temperature value of 104F, the mean maximum temperature at YPG for May, the coolest of the summer season testing months, than they are when determined by comparison with a value of 113F, the mean maximum temperature at YPG for July, the warmest month. The most prominent area of temperature exceedance is the desert region of North Africa, which is hotter than Yuma at all levels of comparison used in this study. GRA

N75-21907# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
A NUMERICAL FORECASTING MODEL FOR OPERATIONAL USE IN THE TROPICS Air Force Surveys in Geophysics
Louis Berkofsky 16 Aug. 1974 49 p refs
(AF Proj. 8604)
(AD-A003343; AFCRL-AFSG-291; AFCRL-TR-74-0398) Avail: NTIS CSCL 04/2
In the present study, the author derives the equations for a model for operational forecasting in the tropics. A vertically integrated boundary layer model is used, together with a multilevel free air model, and and it is assumed that their interface represents cumulus cloud bases. Whenever the model predicts the existence of cumulus clouds (conditional instability, saturation, upward vertical velocity at the top of the boundary layer), a system of cloud equations is solved in order to calculate the latent heating, evaporation, and divergence of eddy heat flux effects on the free air motions. GRA

N75-21908# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
SATELLITE WEATHER RADAR Instrumentation Papers
William B. Goggins, Jr. 30 Sep. 1974 30 p refs
(AF Proj. 5635)
(AD-A003385; AFCRL-IP-222; AFCRL-TR-74-0479) Avail: NTIS CSCL 04/2
The problem of making radar measurements of meteorological phenomena such as rainfall, clouds, and ice crystal formation from a satellite is discussed. The main problem areas are obtaining sufficient signal-to-noise ratio within the weight limitation of the satellite system and avoiding ground clutter when scanning any significant angle off Nadir. Sufficient signal-to-noise ratio to detect heavy rainfall at 35 GHz is available for a downlooking only system within the weight power limitation of the Military Meteorological Satellites. An arrested aperture Doppler system to reject ground clutter at large scan angles off nadir while detecting rainfall by Doppler due to its vertical motion is suggested. GRA

N75-21695 Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF METEOROLOGICAL ELEMENTS USING COMPLETE SYSTEMS OF SOLVING PREDICATES AND RECOGNITION GRAPHS
A. V. Timofeyev *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 14-25 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 13-23 (For availability see N75-21693 13-42)

N75-21696 Joint Publications Research Service, Arlington, Va.
FORECASTING THE MONTHLY PRECIPITATION TOTALS FOR EASTERN SIBERIA AND THE FAR EAST DURING THE WARM HALF OF THE YEAR
G. V. Svinukhov *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 26-30 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 24-27 (For availability see N75-21693 13-42)

N75-21706 Joint Publications Research Service, Arlington, Va.
CLOUDINESS IN THE TROPICAL ZONE OF THE NORTH ATLANTIC (GATE AREA)
I. V. Morozova *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 111-120 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 89-96 (For availability see N75-21693 13-42)

N75-21710 Joint Publications Research Service, Arlington, Va.
ESTIMATING THE STATE OF THE CLEAR SKY BY THE DATA FROM GROUND ACTINOMETRIC OBSERVATIONS
T. V. Kirillova and R. G. Timanovskaya *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 135-139 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 104-106 (For availability see N75-21693 13-42)

N75-21711 Joint Publications Research Service, Arlington, Va.
PROBLEM OF OPTIMAL USE OF FORECASTING INFORMATION WHEN MAKING ECONOMIC DECISIONS
Yu. V. Pokrovskiy *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 140-148 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 107-111 (For availability see N75-21693 13-42)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-21909 Louisiana State Univ., Baton Rouge.
SYSTEMS ANALYSIS OF ECOSYSTEM STABILITY Ph.D. Thesis
Anand Janardan Apte 1974 190 p
Avail: Univ. Microfilms Order No. 75-1910

Methods of systems analysis are applied to coastal zone management for analyzing the stability of natural ecosystems. The following are the important outputs of this research: (1) A least squares method for calibrating dynamic ecosystem models; (2) a dynamic model of an estuarine ecosystem; (3) a Liapunov stability analysis procedure was modified to predict effect of changes in forcing functions on ecosystem stability; (4) stability characteristics for two commonly used biokinetic models; (5) the impact of steady state information flow on the dynamic stability of the system; and (6) realistic stability constraints on the estuarine ecosystem model for Barataria Bay, Louisiana. Dissert. Abstr.

N75-21910# Georgia Marine Science Center, Savannah.
HYDROGRAPHIC FRAMEWORK OF THE DOBOY SOUND ESTUARY AND SURVEYS OF THE OTHER TIDAL INLETS ALONG THE COAST OF GEORGIA
George F. Oertel 1974 64 p refs Sponsored in part by NOAA, Rockville, Md.
(COM-75-10103/0; TR-74-4; NOAA-74121105) Avail: NTIS HC $4.25 CSCL 08J

Hydrographic and sedimentologic research was conducted during the summer of 1970 as part of a study to investigate the sediment budget at the entrance of the Doboy Sound estuary, Georgia. The dynamic diversion of wind, wave and tidal currents results in a predictable sand-shoal geometry at the entrance of the Doboy Sound estuary. Patterns of diversion developed in response to seasonal fluctuations in wind and wave approach interacting with inlet tidal drains. Mutually evasive flow paths of ebb and flood currents influence the formation of shoals adjacent to inlets. Tidal inlets along the Georgia coast have many hydrographic and geomorphic characteristics in common. GRA

N75-21911# Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
PROCEEDINGS OF THE MISSISSIPPI GOVERNOR'S CONFERENCE ON COASTAL ZONE MANAGEMENT
1974 130 p Conf. held at Biloxi, Miss., 24-25 Jul., 1974; sponsored by Miss.-Ala. Sea Grant Consortium, Ocean Springs, Miss.
(COM-75-10078/4; MASGP-74-027; NOAA-74120901) Avail: NTIS HC $5.75 CSCL 13B

The collection of papers include: Benefits to be derived from coastal zone management; The relationship of the Mississippi Marine Resources Council to coastal zone management; The coastal zone management plan for Mississippi; Coastal zone management--An overview from the Federal viewpoint. GRA

N75-21912# Environmental Dynamics, Inc., Los Angeles, Calif.
COMPUTER ASSISTED INTERACTIVE MODELING OF COASTAL PROCESSES: CRAIG MARK 1
J. C. Cleveland, J. A. Dracup, S. G. Grant, J. L. Smith, and R. C. Uzgalis 15 Aug. 1974 180 p refs
(Contract N00014-73-C-0501; NR Proj. 389-163)
(AD-A002738; EDI-3010-74) Avail: NTIS CSCL 13/2

A computer software system, CRAIG Mark 1, has been developed for the purpose of understanding the interrelationships between mathematical models of related coastal processes. Included in the project are initial conceptualization, system design, program coding/debugging and finally, system operation. Two general system objectives were: To facilitate the analysis of individual coastal process models, and to provide for coordination between the models. GRA

N75-21913# National Ocean Survey, Rockville, Md.
TIDAL CURRENT TABLES 1975. ATLANTIC COAST OF NORTH AMERICA
1974 215 p refs
(COM-75-50061/1; NOAA-74121117) Avail: NTIS MF $2.25; HC $2.00 Available from National Ocean Survey, Rockville, Md. 20852 CSCL 08C

Daily predicted times of slack water and predicted times and velocities of maximum current (flood and ebb) are presented in table one for a number of reference stations. Similar predictions for many other locations may be obtained by applying the correction factors listed in table two to the predictions of the appropriate reference station. The velocity of a current at times between slack water maximum current near the time of slack water may be table three. The duration of weak current near the time of slack water may be computed by the use of table four. GRA

N75-21914# Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
THE OCEANS: PLANETARY ENGINEERING AND INTERNATIONAL MANAGEMENT. ANNUAL SEA GRANT LECTURE AND SYMPOSIUM (3RD)
Robert A. Frosch, Judith T. Kildow, and Richard R. Baxter 3 Oct. 1974 45 p refs Conf. held in Cambridge, Mass. Sponsored by NOAA
(COM-75-10086/7; MITSG-75-3; NOAA-74120409) Avail: NTIS HC $3.75 CSCL 08J

The collection of three papers constitutes the third annual sea grant lecture and symposium. The papers are: The oceans: Planetary engineering and international management; Alternatives for an international sea grant effort: and The law of the sea conference; Where we stand now. GRA

N75-21915# Scripps Institution of Oceanography, La Jolla, Calif. Underway Data Processing Group.
INDEX OF SIO CRUISES WITH UNDERWAY GEOPHYSICAL

DATA DEPTH, MAGNETICS, OR SUBBOTTOM PROFILES
V. Psaropulos and S. M. Smith 30 Oct. 1974 10 p
(Contract N00014-69-A-0200-6049; et al)
(AD-A003003; SIO-Ref-74-34) Avail: NTIS CSCL 08/10

The index is an outgrowth of one originally developed for internal use by the Underway Data Processing Group to indicate the status of digitized data. It is not a complete index of all oceanographic cruises ever carried out by the Institution. It contains a list of geophysical, geologic data regarding depth, magnetic and profiler records, data from deep sea drilling project, and other related data. GRA

N75-21916# Sparcom, Inc., Alexandria, Va.
AIRBORNE LASER SHALLOW WATER BATHYMETRIC SYSTEM
G. D. Hickman, A. Ghovanlou, J. E. Hogg, C. S. Gault, and E. J. Friedman Jun. 1974 48 p refs
(Contract N00014-71-C-0202)
(AD-A003016; TR-4) Avail: NTIS CSCL 08/10

Field tests using a pulsed nitrogen/neon dye laser to measure water depths in shallow waters have been completed. These measurements, which were conducted from fishing piers, boats and airplanes were made for the purpose of verifying the empirical model which was developed during the laboratory phase of this program. In nearly all cases, good correlation was found to exist between these field measurements and the empirical model. A summary of the salient laser and system parameters for an airborne laser bathymetry system is included. Laboratory measurements were conducted on laser induced dye fluorescence. The results of these experiments showed that both the depth of a dye cloud (composed of two or more dyes) and its temperature could be determined using ratio detection techniques. GRA

N75-21917# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
COASTAL UPWELLING EXPERIMENT, 1 AND 2 SURFACE HYDROGRAPHIC FIELDS DATA REPORT
Thomas B. Curtin and N. K. Christopher Mooers Jul. 1974 23 p refs Sponsored by NSF
(PB-238460/0; UM-RSMAS-74026) Avail: NTIS HC $3.25 CSCL 08J

All the continuous surface temperature-salinity data recorded aboard Oregon State University vessels during the summers of 1972 and 1973 are presented. The vessels sailing the various cruises during these periods were the R/V Yaquina, R/V Cayuse, and R/V Paiute. Most of these cruises constituted part of the Coastal Upwelling Experiments (CUE-I and CUE-II), a multi-institutional program sponsored by IDOE to study upwelling off the Oregon coast. The specific objectives of the individual cruises were quite varied; however, the primary focus being the synoptic study of coastal upwelling off Oregon, cruise tracklines were mainly concentrated over the continental shelf region. GRA

N75-21918# National Ocean Survey, Rockville, Md.
TIDE TABLES, HIGH AND LOW WATER PREDICTIONS, 1975. CENTRAL AND WESTERN PACIFIC OCEAN AND INDIAN OCEAN
1974 387 p
(COM-75-50062/9; NOAA-74120401) Avail: NTIS MF $2.25; HC $2.00 available from National Ocean Survey, Rockville, Md. 20852 CSCL 08C

The edition of the tide tables, central and western Pacific Ocean and Indian Ocean contains full daily predictions for 74 reference stations and differences and other constants for about 1,900 stations. It contains also a table for obtaining the approximate height of the tide at any time, a table of local mean time of sunrise and sunset for every fifth day of the year for different latitudes, a table for the reduction of local mean time to standard time, and a table of the Greenwich mean time of the moon's phases, apogee, perigee, greatest north and south and zero declination, and the time of the solar equinoxes and solstices. GRA

N75-21919# National Ocean Survey, Rockville, Md.
TIDAL CURRENT TABLES: 1975. PACIFIC COAST OF NORTH AMERICA AND ASIA
1974 258 p
(COM-75-50077/7; NOAA-74123004) Avail: NTIS MF $2.25; HC $2.00 available from National Ocean Survey, Rockville, Md. 20852 CSCL 08C

Daily predicted times of slack water and predicted times and velocities of maximum current (flood and ebb) are presented in table 1 for a number of reference stations. Similar predictions for many other locations may be obtained by applying the correction factors listed in table 2 to the predictions of the appropriate reference station. The velocity of a current at times between slack water and maximum current may be approximated by the use of table 3. The duration of weak current near the time of slack water may be computed by the use of table 4. GRA

N75-21700 Joint Publications Research Service, Arlington, Va.
DIAGNOSTIC CALCULATIONS OF CURRENTS IN THE TROPICAL ATLANTIC
Yu. L. Demin *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 59-71 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 48-57 (For availability see N75-21693 13-42)

N75-21701 Joint Publications Research Service, Arlington, Va.
NUMERICAL CALCULATION OF STATIONARY CIRCULATION IN THE BLACK SEA BY TYPICAL WIND FIELDS
L. V. Moskalenko *In its* Meteorology and Hydrology, No. 1, 1975 (JPRS-64448) 31 Mar. 1975 p 72-79 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 1, 1975 p 58-64 (For availability see N75-21693 13-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-21920*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GODDARD EARTH MODELS (5 AND 6)
Francis J. Lerch, Carl A. Wagner, James A. Richardson (Computer Science Corp., Silver Spring, Md.), and Joseph E. Brownd (Computer Science Corp., Silver Spring, Md.) Dec. 1974 238 p refs Submitted for publication
(NASA-TM-X-70868; X-921-74-145) Avail: NTIS HC $7.50 CSCL 08E

A comprehensive earth model has been developed that consists of two complementary gravitational fields and center-of-mass locations for 134 tracking stations on the earth's surface. One gravitational field is derived solely from satellite tracking data. This data on 27 satellite orbits is the most extensive used for such a solution. A second solution uses this data with 13,400 simultaneous events from satellite camera observations and surface gravimetric anomalies. The satellite-only solution as a whole is accurate to about 4.5 milligals as judged by the surface gravity data. The majority of the station coordinates are accurate to better than 10 meters as judged by independent results from geodetic surveys and by Doppler tracking of both distant space probes and near earth orbits. Author

N75-21921*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVED METHOD OF DETECTING AND COUNTING BACTERIA Patent Application
Grace L. Picciolo and Emmett W. Chappelle, inventors (to NASA) Filed 5 Mar. 1975 21 p
(NASA-Case-GSC-11917-2; US-Patent-Appl-SN-555641) Avail: NTIS HC $3.25 CSCL 06M

An improved method is provided for determining bacterial levels, especially in samples of aqueous physiological fluids. The method depends on the quantitative determination of bacterial adenosine triphosphate (ATP) in the presence of nonbacterial ATP. Bacterial ATP is released by cell rupture and is measured by an enzymatic bioluminescent assay. A concentration technique is included to make the method more sensitive. It is particularly useful where the fluid to be measured contains an unknown or low bacteria count. NASA

N75-21922# Texas A&M Univ., College Station. Dept. of Biology.

SUBLETHAL EFFECTS OF OIL, HEAVY METALS AND PCBS ON MARINE ORGANISMS

J. W. Anderson, J. M. Neff, and S. R. Petrocelli 1974 48 p refs Presented at The Mechanisms of Survival in Toxic Environments Symp., Dec. 1974

(Grants NSF GX-37344; NSF GX-37347)

(PB-238514/4) Avail: NTIS HC $3.75 CSCL 08A

The sublethal effects of three major classes of pollutants commonly found in the estuarine environment are studied. Heavy metals and chlorinated hydrocarbons are in general accumulated to a greater extent and bound to organisms much more firmly than petroleum hydrocarbons. Retention of petroleum derived hydrocarbons by animals in clean water may vary from several days to approximately two months, and is species dependent. The class of petroleum hydrocarbons accumulated to the greatest extent and retained the longest is the naphthalenes. Inorganic mercury, Aroclor 1254 and petroleum hydrocarbons have been shown to affect the respiratory rate and chloride ion regulation of selected marine animals. GRA

N75-21923# School of Aerospace Medicine, Brooks AFB, Tex.
CIRCULATING RED CELLS IN RATS WITH SIMILAR TISSUE PO2 BUT DIFFERING PCO2 Final Report, Jan. 1971 - Dec. 1972

William E. Pepelko Sep. 1974 12 p refs

(AF Proj. 7164)

(AD-A003432; SAM-TR-74-31) Avail: NTIS CSCL 06/19

To investigate the effect of CO2 upon erythropoiesis, adult female rats were exposed to 1 of 3 gaseous environments designed to produce similar tissue PO2, but widely differing PCO2. Tissue PCO2 was varied from 38 to 69 torr, while PO2 averaged near 22 torr. Inspired PO2 of the nonhypercapnic rats approximated that found at 11,000-ft. altitude. Tissue PO2 and PCO2 were estimated from measurements of subcutaneous-gas-pocket contents. Hematocrit and circulating red cell volume were significantly (P .001) greater in two hypercapnic groups as compared with those inspiring no CO2 after 40 days of continuous exposure. Reticulocyte counts were greater in two hypercapnic groups after four days of exposure (P .001), but not after 40 days. The conclusion is that when tissue PO2 was held constant, additional CO2 increased the circulating red cells. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-21924 Washington Univ., Seattle.
A DYNAMIC VISCOELASTIC ANALYSIS OF THE HUMAN HEAD Ph.D. Thesis

Krishan Kishore Wahi 1974 210 p

Avail: Univ. Microfilms Order No. 75-4061

Indications of trauma manisfested by stress levels which could generate neuron darkening and higher level tensile waves are investigated through the use of digital computer solutions. The head is modeled as a body of revolution and as a body with translational symmetry. The models are analyzed using a two dimensional Lagrangian finite difference digital computer solution. The skull is modeled with two layers of hard bone and a central layer of soft bone. The brain material is modeled both as a perfect fluid and as a viscoelastic material. The viscoelastic model gives results that show significantly lower (about 35%) compression and rarefaction levels in the brain for both high and low level loading. Locations of possible brain trauma are identified. Comparisons are made between the experimental results and the computer solutions. Dissert. Abstr.

N75-21925 Pennsylvania Univ., Philadelphia.
STUDIES ON THE MULTIPLICITY AND ENTRAINMENT OF CIRCADIAN OSCILLATORS Ph.D. Thesis

Susan Craig Edmonds 1974 82 p

Avail: Univ. Microfilms Order No. 75-2724

A system of multiple oscillators underlies the circadian system in mammals. In an animal entrained to a 24 hour light-dark (LD) cycle, many different physiological and behavioral variables maintain the same 24 hour periodicity, but differ in phase. The current studies were designed to investigate what kinds of internal coupling among oscillators, and external couplings with environmental events might produce such an outcome. In both studies, rats were used as subjects, and running wheel activity was the dependent variable. The first experiment demonstrated that periodic food access can be a powerful entrainer of circadian activity rhythms in the rat. In the second experiment, rats were housed in constant light, and the only regular environmental events were two periodic feedings. The activity patterns which resulted indicated that circadian activity rhythms in the rat are controlled by at least two separate oscillators. Dissert. Abstr.

N75-21926 Florida Univ., Gainesville.
SEMIAUTOMATIC DETECTION AND ANALYSIS OF RAPID EYE MOVEMENT PATTERNS IN HUMAN SLEEP Ph.D. Thesis

Periklis Yiannis Ktonas 1974 396 p

Avail: Univ. Microfilms Order No. 75-3502

The recording, detection and analysis of rapid eye movement (REM) patterns in human sleep is reported. Emphasis is placed on the detailed description and evaluation of a modified version of an existing special electronic system for the automatic detection of REMs, as well as on the detailed description and evaluation of a software, man-machine interactive package interfacing this automatic detection system to a small, general purpose digital minicomputer for the further processing of the REM detection times in search of an effective modeling and quantification of REM patterns. Dissert. Abstr.

N75-21927 Florida Univ., Gainesville.
ASPECTS OF ULTRADIAN RHYTHMS IN MAN Ph.D. Thesis

Peretz Lavie 1974 197 p

Avail: Univ. Microfilms Order No. 75-3503

Three related experiments were conducted in order: (1) to explore the relationship between the REM-NONREM cycle and the waking cycle in the perception of the spiral after-effect (SAE); (2) to assess the influence of interruptions of REM and NONREM sleep on the perception of the beta movement; and (3) to compare the possible cyclicity in perception of the beta M during waking with the cyclicity in the perception of the SAE. Subjects awakened from REM sleep revealed perceptual cycles out of phase with respect to the perceptual cycles of Ss awakened from NONREM sleep. The results were interpreted to support the accumulated data for the existence of a waking ultradian biorhythm which is synchronized with that of the REM-NONREM cycle.

Dissert. Abstr.

N75-21928*# Texas Univ. Health Science Center, Dallas. Pauline and Adolph Weinberger Lab. for Cardiopulmonary Research.
CARDIOVASCULAR EFFECTS OF VARIATIONS IN HABITUAL LEVELS OF PHYSICAL ACTIVITY Final Technical Report

C. Gunnar Blomqvist and Jere H. Mitchell 22 Apr. 1975 9 p refs

(Grant NGR-44-012-151)

(NASA-CR-142616) Avail: NTIS HC $3.25 CSCL 06S

Mechanisms involved in human cardiovascular adaption to stress, particularly adaption to different levels of physical activity are determined along with quantitative noninvasive methods for evaluation of cardiovascular function during stess in normal subjects and in individuals with latent or manifest cardiovascular disease. Results are summarized. Author

N75-21929*# Scientific Translation Service, Santa Barbara, Calif.
VARIATIONS IN INTERNAL TEMPERATURE AND HEART RATE AS A FUNCTION OF METABOLISM AND ENVIRONMENT DURING POSITIVE AND NEGATIVE WORK

F.-A. Missenard Washington NASA Apr. 1975 10 p refs Transl. into ENGLISH from Arch. Sci. Physiol. (Paris), 1973 p A263-269

(Contract NASw-2483)

(NASA-TT-F-16260) Avail: NTIS HC $3.25 CSCL 06S

Equations are formulated for the relationships between rectal temperature, metabolism, ambient temperature and heart rate for both positive and negative physical work. When performing

negative work, the cyclometer is powered by a motor and the subject brakes it with his legs. The equations were confirmed by measurements. Author

N75-21930# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.
CHANGES IN BODY COMPOSITION DURING AN ARCTIC WINTER EXERCISE
W. J. OHara and C. L. Allen Nov. 1974 32 p refs
(DCIEM-74-R-1061) Avail: NTIS HC $3.75

The effects of long range Arctic winter patrols on body and urine composition were examined during a two week exercise. Each man carried 30kg of clothing and equipment, and for one third of the patrol time would assist in pulling a 180 kg cargo tobogan. During the first week of the exercise the men traversed 25,000 meter in 12 hours at a speed of 2,000 m/hour. Daily temperatures ranged from -38 F to +7 F with a mean of -20 deg F. Mean wind speed and maximum daily windchill were 16.5 mph and 2,032 Kcal/M sqared/hr respectively. During the second week they covered 44,000 meter in 16 hours at a speed of 2,750 m/hour. Energy expenditure studies indicated an approximate caloric balance. The mean decrease in body weight was 1.0 kg. Skinfold thickness decreased by 38%, equivalent to a 21.9% loss of body fat. Urinalysis showed an unusually high incidence of proteinuria and ketonuria. Author

N75-21931*# Kanner (Leo) Associates, Redwood City, Calif.
THE THERMOREGULATORY SYSTEM: REGULATED SYSTEM OR SERVO SYSTEM?
Y. Houdas and J. D. Guieu Washington NASA 29 Apr. 1975 37 p refs Transl. into ENGLISH from Arch. Sci. Physiol. (France), v. 27, 1973 p A311-A338
(Contract NASw-2481)
(NASA-TT-F-16256) Avail: NTIS HC $3.75 CSCL 06P

Control theory is used to construct a model of the human thermoregulatory system to determine the nature of the mechanism which keeps the body at a relatively constant temperature. Findings seem to negate the set-point theory, indicating that, rather than returning its central temperature to a set point, the body instead seeks to return its instantaneous heat storage rate to zero. The system is therefore a servo system. Author

N75-21932*# Kanner (Leo) Associates, Redwood City, Calif.
THERMAL CONDUCTIVITY OF THE HUMAN BODY DURING IMMERSION AT THERMAL NEUTRALITY AND IN A COLD ENVIRONMENT
C. Boutelier, J. Timbal, and J. Colin Washington NASA Mar. 1975 25 p refs Transl. into ENGLISH from Arch. Sci. Physiol. (Paris), v. 27, 1973 p 189-205
(NASA-TT-F-16258) Avail: NTIS HC $3.25 CSCL 06S

The thermal conductivity of the body immersed in water at thermal neutrality is found to be close to that observed in air, with only slight variations between individuals and no apparent effect due to the quantity of adipose tissue. In cold water, however, conductivity does depend on the fatness or thinness of the subject, since cutaneous vasoconstriction occurs, making use of the layer of subcutaneous fat to insulate the body center from the cold. The effect of cutaneous vasoconstriction is limited, however, and the muscular region is found to contribute to peripheral insulation, a phenomenon which has been considered a characteristic of adaptation to cold. Author

N75-21933*# Scientific Translation Service, Santa Barbara, Calif.
CHANGES IN RECTAL AND CUTANEOUS TEMPERATURE DURING MUSCULAR EXERCISE PERFORMED IN AIR TEMPERATURE BETWEEN 10 DEGREES AND 30 DEGREES C
V. Candas, J. J. Vogt, and J. P. Libert Washington NASA Apr. 1975 11 p refs Transl. into ENGLISH from Arch. Sci. Physiol. (France), v. 27, 1973 p A239-A246
(Contract NASw-2483)
(NASA-TT-F-16259) Avail: NTIS HC $3.25 CSCL 06/5

Students were subjected to large variations in ambient temperature while performing muscular exercise (pedalling machine). Rectal and cutaneous temperatures were measured. Slight effects were found for air temperatures below 5 C and above 30 C. Author

N75-21934*# Scientific Translation Service, Santa Barbara, Calif.
CUTANEOUS CIRCULATION AND THERMAL EXCHANGE AT ALTITUDE (3800 m)
J. Raynaud, P. Varene, H. Vieillefond, and J. Durand Washington NASA Apr. 1975 11 p refs Transl. into ENGLISH from Arch. Sci. Physiol. (Paris), v. 27, 1973 p A247-A254
(Contract NASw-2483)
(NASA-TT-F-16311) Avail: NTIS HC $3.25 CSCL 06S

The effect of high altitudes upon cutaneous circulation and thermal exchange is studied. It is concluded that at high altitudes the effects of hypoxia and hypocapnia can be dissociated. Author

N75-21935*# Texas Univ. Health Science Center, Dallas. Dental Branch.
CHEMICO-THERAPEUTIC APPROACH TO PREVENTION OF DENTAL CARIES Final Report, period ending 28 Feb. 1975
Ira L. Shannon 5 Mar. 1975 17 p
(Contract NAS9-10566)
(NASA-CR-141762) Avail: NTIS HC $3.25

The program of chemical preventive dentistry is based primarily upon the development of a procedure for stabilizing stannous fluoride in solution by forcing it into glycerin. New topical fluoride treatment concentrates, fluoride containing gels and prophylaxis pastes, as well as a completely stable stannous fluoride dentifrice are made possible by the development of a rather complicated heat application method to force stannous fluoride into solution in glycerin. That the stannous fluoride is clinically effective in such a preparation is demonstrated briefly on orthodontic patients. Author

N75-21936# Oak Ridge National Lab., Tenn.
ESTIMATED RADIATION DOSES FROM INGESTION OF TRITIUM-CONTAINING CONSUMER PRODUCTS MADE WITH HYDROCARBONS FROM NUCLEARLY STIMULATED NATURAL GAS WELLS
C. J. Barton and S. A. Reynolds Dec. 1974 30 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4730) Avail: NTIS HC $3.75

Commercial scale use of nuclear explosives to increase production of natural gas could result in the introduction of hydrocarbons containing tritium into petrochemical feedstocks. This report considers radiation doses that could be received from ingestion of several products hypothetically produced from natural gas containing 1 pCi of tritium/cu cm of gas. One of the highest estimated whole body doses was from ingestion of sufficient ethyl alcohol to maintain a concentration of 0.15% the intoxication level, in the body water throughout the year. A slightly higher dose was estimated for ingestion of a synthetic protein supplement. Estimated wholebody doses from ingestion of other products ranged from 0.5 millirem/year for an individual eating one lb/day of a hydrogenated fat or oil product to 0.005 millirem/year for a person taking eight aspirin tablets per day. Author (NSA)

N75-21937# Texas Univ., Austin. Center for Cybernetic Studies.
POWER SPECTRUM OF THE RESPIRATORY SYSTEM
Edward L. Frome, Evan L. Frederickson, and C. C. Lushbaugh Nov. 1974 20 p refs
(Contracts N00014-67-A-0126-0008; N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-A002958; CCS-188) Avail: NTIS CSCL 06/16

Spectrum analysis is proposed as a method for analyzing biologic time series data that arises in the study of respiration. A mechanical model of the respiratory system is used to provide a theoretical basis for the interpretation of the air flow spectrum in terms of a physically defined energy concept. The authors show that under certain conditions the flow variance is proportional to the mechanical work of breathing, and indicate how this new parameter is related to conventional measures of respiratory function. An example is presented to describe the computational procedure and to illustrate the graphical aspects of cross-spectrum analysis. GRA

N75-21938# Naval Aerospace Medical Research Lab., Pensacola, Fla.

HYPERBARIC-HYPOBARIC INTERACTIONS AS THEY RELATE TO COMPRESSED AIR DIVING AND AVIATION: CANINE EXPERIMENT Special Report
James L. Kupper, Walter P. Trevethan, and Richard J. Brown
Nov. 1974 14 p refs
(AD-A003073; NAMRL-SR-74-1) Avail: NTIS CSCL 06/19

To confirm or refute the existing regulation requiring a 24 hour interval between diving and flying, dogs were exposed to increased ambient pressures equivalent to water depths encountered in normal professional and recreational diving. The animals were subsequently exposed to reduced pressures comparable to those experienced by naval aircrew members. Various times between hyperbaric and hypobaric episodes were evaluated. The experimental animals were examined using the following methods: clinical signs; clinico-pathologic determinations; pulmonary interstitial fluid volume; gross pathology; and light microscopy. Evidence of decompression sickness was found. Insofar as the findings may apply to man, a period greater than 12 hours should elapse between diving and flying. An experimental animal species more closely related to man is being examined in larger numbers to precisely define the safe interval. GRA

N75-21939# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
MEASUREMENT OF HUMAN HEAD RESULTANT ACCELERATION IMPACT
Joseph ORourke 12 Nov. 1974 21 p refs
(AD-A002971; NADC-74210-40) Avail: NTIS CSCL 06/19

The report describes a method for measuring the resultant acceleration at the center of mass of a human subject's head during a simulated crash. An equation is derived giving the resultant acceleration as a simple function of four accelerations measured at points outside the head. Two experiments are described which show that the equation is valid and yields accurate results under test conditions. It is also shown that the calculation of resultant acceleration is not unduly sensitive to small errors in the center of mass location. GRA

N75-21940# Southwest Research Inst., San Antonio, Tex.
A LITERATURE SEARCH AND ANALYSIS OF INFORMATION REGARDING SOURCES, USES, PRODUCTION, CONSUMPTION, REPORTED MEDICAL CASES, AND TOXICOLOGY OF PLATINUM AND PALLADIUM Final Report, 15 Feb. - 15 Apr. 1974
Richard A. Mayer, W. Laurence Prehn, Jr., and Donald E. Johnson
Apr. 1974 49 p
(Contract EPA-68-02-1274)
(PB-238546/6; EPA-650/1-74-008) Avail: NTIS HC $3.75 CSCL 07B

An intensive search of the literature provides the basis for the following conclusions concerning platinum and palladium. An average of 3.7 million troy ounces of platinum and palladium were produced in the world in the four-year 1969-1972 period. The United States consumed about a third of this. The proved world reserves amount to some 394 million troy ounces; half of the proved reserves are in the Republic of South Africa and 45% in the Soviet Union. Investigations show that only the salts of platinum present human health hazards. Industrial exposure to these is limited to the mining and refining of platinum ores and the preparation of catalysts for chemical and petroleum refining industries. GRA

N75-21941# Human Factors Research, Inc., Goleta, Calif.
A STUDY OF HEAT, NOISE, AND VIBRATION IN RELATION TO DRIVER PERFORMANCE AND PHYSIOLOGICAL STATUS Final Report, Jun. 1972 - Jun. 1974
Robert R. Mackie, James F. OHanlon, and Michael McCauley
Dec. 1974 263 p refs
(Contract DOT-HS-241-2-420)
(PB-238829/6; DOT-HS-801-313) Avail: NTIS HC $8.50 CSCL 06S

Experimental studies were conducted on the highway to determine the effects of heat, noise, and vibration on the driving performance, subjective feelings of alertness and fatigue, and physiological signs of stress among drivers of passenger cars and trucks. Heat stress was shown to significantly affect both driver performance and various indices of central nervous system arousal felt to be important to driving safety. It was shown that the noise stress was sufficient to induce permanent hearing loss in some drivers and that the amount of vibration stress, unless compensated for by properly designed seats, was borderline with respect to current standards for 'fatigue-decreased proficiency.' A review of pertinent literature on stress and human reactions to it is included. GRA

N75-21942# Gulf General Atomic, San Diego, Calif.
THE COMPATIBILITY OF CARBON WITH BLOOD Annual Report, 1 Mar. 1973 - 31 Oct. 1974
C. H. Meyer, Jr., A. D. Haubold, J. Kaae, J. Parez, and H. Shim
7 Nov. 1974 106 p refs
(Contract N01-HB-3-2954; Proj. 0663)
(PB-238753/8; GA-A/3211) Avail: NTIS HC $5.25 CSCL 06L

The goals of this program were the development of techniques for vacuum vapor depositing carbon films onto various polymer substrates and the determination of the relevant structural and mechanical properties of the resultant composites. Poly (dimethylsiloxane-co-carbonate), Kapton, polyether urethane, cellulose acetate, and 'springy' polypropylene were coated with vacuum-vapor-deposited (VVD) carbon. The deposition techniques for these materials are discussed. The permeability, adhesion, strain-to-fracture, structure, and surface topography of VVD carbon are reported. Vacuum-vapor-deposited carbon has a two-dimensional crystal structure with graphitic layer planes but no order between atoms in adjacent planes. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-21943 United States International Univ., San Diego, Calif.
PREDICTION OF NAVAL AVIATOR CAREER MOTIVATION AND JOB SATISFACTION FROM THE STRONG VOCATIONAL INTEREST BLANK Ph.D. Thesis
David William Robertson 1975 194 p
Avail: Univ. Microfilms Order No. 75-4294

Job satisfaction questionaires and strong vocational interest blanks were administered to Navy aviators. The results lead to the following conclusions: (1) the Naval aviator SVIB scales which were constructed could be employed effectively in career guidance and in increasing career retention; (2) scales constructed separately on the noncareer subgroups, as multiple predictors of retention, yield validities slightly larger than does a single scale constructed on the total noncareer group; (3) the obtained low correlations of job satisfaction with SVIB predictors and also with retention suggest that many applicants may enter the program for other than Navy career purposes; and (4) in employing Naval aviator job satisfaction measures to test the function setting value orientation, the extrinsic items provided partial support, and the intrinsic items, strong support. Dissert. Abstr.

N75-21944 Texas A&M Univ., College Station.
THE EFFECT OF CERTAIN GIMBAL ORDERS AND WORKLOADS ON TARGET DETECTION, RECOGNITION, AND IDENTIFICATION Ph.D. Thesis
Dennis Lee Price 1974 158 p
Avail: Univ. Microfilms Order No. 75-2883

If air-to-ground imaging sensors are mounted to the aircraft by different gimbal order systems, the scenery at the displays will rotate differently even though the aircraft flight paths are identical. Eighteen experienced pilots were tested in this simulation study in order to investigate the effects such different scene motions might have on target detection, recognition, and identification performance, and also on operator workload. Significant differences existed between gimbal orders. In general, roll-pitch was associated with the poorest performance and pitch-yaw, with the best. Yaw-pitch was associated with scores somewhere between that of the other two orders.
Dissert. Abstr.

N75-21945# Naval Aerospace Medical Research Lab., Pensacola, Fla.

DIFFERENTIATING APTITUDE FACTORS AMONG CURRENT AVIATION SPECIALTIES
Rosalie K. Ambler and Margaret J. Smith 23 Aug. 1974 22 p ref
(MF51524002)
(AD-A003033; NAMRL-1207) Avail: NT CSCL 05/9

An automated system of test construction is under development that involves accessing a large bank of test item data. In support of this development this study examined test material which, with the exception of a biographical inventory, covered a wide spectrum of cognitive abilities. The objective was to determine the kinds of test items that are most relevant for use in screening and classification for current aviation specialties, and thus to establish guidelines for investments into the test item bank. By means of a series of factor analyses of test scores and criterion data five cognitive ability factors and a motivational factor were identified. The potential discriminatory validity of each factor was defined for the Naval Flight Officer (NFO) and pilot programs, and for various specialties within these programs. GRA

N75-21946# Dunlap and Associates, Inc., la Jolla, Calif.
EVALUATION OF THE SPECIAL SENSES FOR FLYING DUTIES: PERCEPTUAL ABILITIES OF LANDING SIGNAL OFFICERS (LSOs)
C. A. Brictson Sep. 1974 11 p refs
(Contract N00014-73-C-0053; NR Proj. 201-146)
(AD-A003040) Avail: NTIS CSCL 05/9

The job of the Landing Signal Officer is to provide for the safe and expeditious recovery of aircraft aboard ship. Perceptual abilities related to job performance were identified and used as a basis to select a preliminary battery of perceptual tests which were administered to qualified LSOs and trainees. Results indicate that LSOs may be differentiated on the basis of perceptual style on a field independence dimension. Suggestions for validation of the test battery against LSO performance criteria are presented and reviewed. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-21947 Wisconsin Univ., Madison.
A COMPUTER CONTROLLED MULTI-TASK POWERED EXOSKELETON FOR PARAPLEGIC PATIENTS Ph.D. Thesis
Jack George Grundmann 1974 285 p
Avail: Univ. Microfilms Order No. 74-27739

A hydraulically powered device under computer control is developed which is capable of ambulating a paraplegic patient. It can perform on command such tasks as walking, standing from a seated posture, stepping over obstacles, and climbing stairs. These actions can be executed at different speeds and in partial or full cycles. The system is designed for powering by portable dc batteries housed in a backpack also containing an electric motor, a hydraulic pump, and an accumulator. Computer controlled servovalves provide fluid under pressure to operate actuators placed at the different joints in a preprogrammed pattern for each particular task. The interface between the patient and the structure is at a fiberglass corset which supports the patient's weight. The powered leg braces are connected to the corset and in turn support the structure and the patient. Dissert. Abstr.

N75-21948*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND SYSTEM FOR IN VIVO MEASUREMENT OF BONE TISSUE Patent Application
John R. Cameron (Harvard Med. Coll.) and Philip F. Judy, inventors (to NASA) (Harvard Med. Coll.) Filed 11 Mar. 1975 24 p Sponsored by NASA
(NASA-Case-MSC-14276-1; US-Patent-Appl-SN-557430) Avail: NTIS HC $3.25 CSCL 06B

Methods and apparatus are provided for radiologically determining the bone mineral content of living human bone tissue independently of the concurrent presence of adipose and other soft tissues. A target section of the body of the subject is irradiated with a beam of penetrative radiations of preselected energy to determine the attenuation of such beam with respect to the intensity of each of two radiations of different predetermined energy levels. The resulting measurements are then employed to determine bone mineral content. NASA

N75-21949# School of Aerospace Medicine, Brooks AFB, Tex.
AN OXYGEN-SPARING MASK Final Report, 1 Apr. - 1 Aug. 1974
Robert M. Olson, Ronald D. Holden, and Ewald W. Koegel Oct. 1974 17 p refs
(AF Proj. 7164)
(AD-A003431; SAM-TR-74-49) Avail: NTIS CSCL 06/11

A mask has been developed which leads to very substantial oxygen saving without compromising the purity of the oxygen breathed, and without adding clumsy equipment to the subject's gear. The mask is designed so that during exhalation the CO2-contaminated oxygen coming from the alveoli is separated from the uncontaminated oxygen coming from the trachea, mouth, and mask dead space. The clean oxygen is stored and rebreathed during the next respiratory cycle. GRA

N75-21950# National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF SOLID STATE SAMPLERS FOR WORK ATMOSPHERES Semiannual Report, 1 Jan. - 30 Jun. 1974
B. Greifer, B. C. Capdoff, J. Wing, and J. K. Taylor Jun. 1974 55 p refs Sponsored in part by National Inst. for Occupational Safety and Health, Cincinnati
(COM-74-11720/1; NBSIR-74-527) Avail: NTIS HC $4.25 CSCL 06J

A program is described for evaluating the efficiency of solid sorbers for collecting trace quantities of hydrogen fluoride, phospine, hydrogen cyanide, chlorine, and fluorine in work atmospheres for subsequent laboratory analysis. The gas handling and sampling instrumentation is described, and experimental results to date are presented. Sodium acetate is a very efficient sorber for hydrogen fluoride, and its solubility in water proves to be highly advantageous for subsequent HF determination by ion selective electrode. Potassium permanganate impregnated silica gel sorbs phosphine effectively, and Ascarite was found to sorb hydrogen cyanide, but quantitative experiments on the latter two systems are still in progress. GRA

N75-21951# Whittaker Corp., Waltham, Mass. Space Sciences Div.
ION BEAM DEPOSITED CARBON COATINGS FOR BIOCOMPATIBLE MATERIALS Comprehensive Report, 1 Dec. 1973 - 30 Nov. 1974
S. Aisenberg and R. W. Chabot Nov. 1974 63 p refs
(Contract NO1-HB-3-2919)
(PB-238761/1; SSD-P-711-II-CR) Avail: NTIS HC $4.25 CSCL 06L

Ion beam deposited (IBD) carbon coatings were studied with regard to physico-chemical properties and blood compatibility. Measurements relative to surface charge, chemical surface groups, crystallinity, and surface smoothness were made. The carbon coatings are smooth amorphous, and present an oxidized surface that is rich in hydrocarbons. A low gas permeability, high critical surface tension, and excellent adhesion to various substrates were observed. Results of vena cava, renal embolus, and ex-vivo tests indicate a high degree of thromboresistance for this material. GRA

N75-22256* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATION IN SPACE
B. Petrov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 1-4 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 3-6 (For availability see N75-22255 13-99)
CSCL 05/8

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N75-21952*# Kanner (Leo) Associates, Redwood City, Calif.
CONFERENCE OF THE INFORMATION PROCESSING SECTION OF INTERKOSMOS (COLLECTION OF REPORTS)
H. Pfau, ed. Washington NASA Apr. 1975 222 p refs Transl. into ENGLISH of the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 322 p Conf. held at Moscow, 26 Mar. - 4 Apr. 1973
(Contract NASw-2481)
(NASA-TT-F-16164) Avail: NTIS HC $7.25 CSCL 09B

Selected papers are presented which discuss the processing, mass storage, long-term storage, and retrieval of large files of data obtained from space experiments made using satellites. Other topics discussed include the following: storage devices, programming languages, statistical data reduction techniques, and display techniques. For individual titles, see N75-21953 through N75-21976.

N75-21953* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIENCE GAINED ON IBM 360 COMPUTER IN THE PRELIMINARY PROCESSING OF TELEMETRY DATA RECORDED ON MAGNETIC TAPE c60
K. Bratkovska *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 1-2 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 1-3 (For availability see N75-21952 13-59)
CSCL 09B

Telemetry data from the 'Copernicus' experiment stored on magnetic tape on the Ural-IX computer are transcribed to the internal memory of the IBM 360 computer. Operations involved in this process are described. J.M.S.

N75-21954* Kanner (Leo) Associates, Redwood City, Calif.
COMPUTERIZED PROCESSING OF DATA FROM INTERKOSMOS-7 AND INTERKOSMOS-8 SATELLITE EXPERIMENTS c60
H. Pfau *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 3-7 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 4-11 (For availability see N75-21952 13-59)
CSCL 09B

Computerized data processing problems are analyzed using telemetry data received from Intercosmos-7 and Intercosmos-8 satellites. Problems related to the restoration of measurement data in the form of piecewise continuous and smooth calibrated functions of time and problems encountered in the scientific interpretation of the experimental results are considered. Curve smoothing is discussed in the case of distinct assignments of calibration levels, synchronization, and synchronization checks over time. A proposal is presented for checking a piecewise linear function providing a simple method for the elimination of isolated values due to channel failures and the separation of individual intervals. Author

N75-21955* Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY DATA PROCESSING SYSTEM FOR TELEMETRY DATA FROM INTERKOSMOS-8 TYPE SATELLITES c60
A. S. Vilchinskaya and V. M. Pokras *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 8-12 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 12-20 (For availability see N75-21952 13-59)
CSCL 09B

The preliminary data processing system (PDPS), a set of algorithms, programs, equipment, data storage and memory devices, and all devices controlling the processing, is described using the Intercosmos-8 satellite as an example. Each stage of the system is considered along with its content and sequence. The essential elements of the data processing structure are described and the concepts underlying the selection of these elements are discussed. Author

N75-21956* Kanner (Leo) Associates, Redwood City, Calif.
GENERAL CHARACTERISTICS OF PRELIMINARY DATA PROCESSING IN THE COPERNICUS EXPERIMENT c82
K. Ziolkovski and K. Kossatski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 13-16 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 21-27 (For availability see N75-21952 13-59)
CSCL 05B

Data from the 'Copernicus' experiment is processed in four stages: setting up of basic arrays, data calibration, graphical display of results, and assignment of results to navigation parameters. Each stage is briefly discussed. J.M.S.

N75-21957* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIENCE GAINED FROM COMPUTER PROCESSING OF PHYSICAL EXPERIMENTAL DATA DURING THE RESTORATION OF MEASURED VALUES c60
Z. N. Mamotko and L. I. Shatrovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 17-33 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 29-57 (For availability see N75-21952 13-59)
CSCL 09B

The processing stage in which the restored values of the physical parameters are received is described. The following main steps are discussed: estimation of the state of the telemetry data, processing of the calibration data, and determination of the errors in the data; data decommutation and analysis of the structure of measurement cycles for each instrument; decoding, estimates of the reliability of the restored data, and their agreement with the models adopted for the measurement process; and analysis of errors due to deterministic and random factors. A block diagram of the method is presented. Author

N75-21958* Kanner (Leo) Associates, Redwood City, Calif.
SOME STATISTICAL ANALYSIS TECHNIQUES FOR THE EFFECT OF SYSTEMATIC INSTRUMENT ERRORS ON THE RESULTS OF MEASUREMENTS IN A SPACE EXPERIMENT c65
S. P. Kondakov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 34-42 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 58-71 (For availability see N75-21952 13-59)
CSCL 12A

Mathematical models of certain systematic telemetry signal errors arising during the passage of the signal through the recording and transmitting blocks of the physical instruments aboard the spacecraft are classified and constructed. Statistical analysis methods are used to determine the background function and relative sensitivity coefficients of the channels of a charged particle detector. Results are presented. A block diagram for a method taking into account the effect of distortions is given. Author

N75-21959* Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF DISCONTINUITIES IN THE DERIVATIVE OF A PIECEWISE-SMOOTH FUNCTION ON THE BASIS OF THE RESULTS OF MEASUREMENTS c65
L. S. Gurin and N. P. Ivanova *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 43-48 ref Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 72-79 (For availability see N75-21952 13-59)
CSCL 12A

A piecewise-smooth function with discontinuity in the first derivative on a given interval is considered. The values of the function are measured at a sequence of points in the interval and a random error is included in the measurements. A method is proposed to estimate the position of the discontinuity in the derivative. Regression lines are associated with each measurement point and account for k - 1 points preceding or following the point. The estimate for the position of the discontinuity is the measurement point with the largest angle between the regression lines. The error in the estimate is analyzed and the results are verified. Author

N75-21960* Kanner (Leo) Associates, Redwood City, Calif.
PROGRAMMING LANGUAGE FOR COMPUTATIONS IN THE INTERKOSMOS PROGRAM c61
K. Schmidt *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-16164) Apr. 1975 p 49-56 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 80-90 (For availability see N75-21952 13-59)
CSCL 09B

The programming system for Intercosmos data processing, based on the structural programming theory, which considers a program as an ordered set of standardized elementary parts, from which the user programs are automatically generated, is described. The programs are comprised of several modules, which are briefly summarized. The general structure of the programming system is presented in a block diagram. A programming control language developed to formulate the problem quickly and completely is presented along with basic symbols which are characteristic of the Intercosmos programming system. J.M.S.

N75-21961* Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF INFORMATION-RETRIEVAL METHODS TO THE CLASSIFICATION OF PHYSICAL DATA c82
Z. N. Mamotko, S. K. Khorolskaya, and L. I. Shatrovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 57-67 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 91-104 (For availability see N75-21952 13-59)
CSCL 05B

Scientific data received from satellites are characterized as a multi-dimensional time series, whose terms are vector functions of a vector of measurement conditions. Information retrieval methods are used to construct lower dimensional samples on the basis of the condition vector, in order to obtain these data and to construct partial relations. The methods are applied to the joint Soviet-French Arkad project. Author

N75-21962* Kanner (Leo) Associates, Redwood City, Calif.
PHOTOTELEVISION DATA DISPLAY METHODS c60
G. A. Avanesov, I. V. Barinov, and V. D. Glazkov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 68-80 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 105-124 (For availability see N75-21952 13-59)
CSCL 09B

Phototelevision devices (PTD) used to graphically display the results obtained from computerized data processing are described. The possibility and specifics of the use of PTD with a digital computer are presented. Requirements are formulated, and the principles used in the design of the PTD are given. General problems in interfacing the PTD and the digital computer are discussed. Recommendations are included. Author

N75-21963* Kanner (Leo) Associates, Redwood City, Calif.
A SYSTEM FOR THE INPUT AND STORAGE OF DATA IN THE BESM-6 DIGITAL COMPUTER c60
K. Schmidt and L. Blenke *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 81-85 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 125-131 (For availability see N75-21952 13-59)
CSCL 09B

Computer programs used for the decoding and storage of large volumes of data on the the BESM-6 computer are described. The following factors are discussed: the programming control language allows the programs to be run as part of a modular programming system used in data processing; data control is executed in a hierarchically built file on magnetic tape with sequential index storage; and the programs are not dependent on the structure of the data. Author

N75-21964* Kanner (Leo) Associates, Redwood City, Calif.
CONSTRUCTION OF THE IMAGE OF A FUNCTION OF TWO VARIABLES USING PHOTOTELEVISION DISPLAYS c60
A. A. Fomenko *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 86-94 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 132-143 (For availability see N75-21952 13-59)
CSCL 09B

A program for the solution of the problem of constructing functions of two variables on a phototelevision display is presented. The algorithm for finding the level lines and their marking and the method used for coding the symbols are described. The algorithm is illustrated using an ALGOL program. Author

N75-21965* Kanner (Leo) Associates, Redwood City, Calif.
THE PROBLEM OF THE MAN-SPACE DATA INTERFACE DURING COMPUTER PROCESSING OF DATA c60
Z. N. Mamotko and V. S. Mokrov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 95-103 ref Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 144-154 (For availability see N75-21952 13-59)
CSCL 09B

The necessity is shown for data output at different processing stages to man, taking into account the processing level, the output objective, and the user. The use of the phototelegraph I/O computer device for this purpose is considered in detail, and several examples are given. It is shown that the type of output (shaded of halftone graphs), the scales, the compression, and the mutual position of the data are selected on the basis of the character of the data displayed. Author

N75-21966* Kanner (Leo) Associates, Redwood City, Calif.
NAVIGATIONAL ASSIGNMENT OF SCIENTIFIC MEASUREMENTS c13
P. Ye. Elyasberg and B. V. Kugayenko *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 104-111 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 155-166 (For availability see N75-21952 13-59)
CSCL 22A

Some problems are considered in the navigational assignment of scientific measurements (the calculation of the position of the center of a spacecraft mass in space) as it applies to the Interkosmos series of artificial satellites. Possible models of disturbing forces and the corresponding perturbations in the orbits are analyzed. The following forces and their effect on artificial satellites are discussed: earth's gravity, atmospheric drag, the moon's gravity, the sun's gravity, and light pressure. Author

N75-21967* Kanner (Leo) Associates, Redwood City, Calif.
ESTIMATION OF THE ACCURACY WITH WHICH THE POSITION OF THE CENTER OF MASS OF AN INTERKOSMOS SERIES ARTIFICIAL EARTH SATELLITE IS CALCULATED c13

P. Ye. Elyasberg, B. V. Kugayenko, and M. I. Voyskovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 112-126 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 167-187 (For availability see N75-21952 13-59)
CSCL 22A

The effects of disturbing forces on position calculation, and errors in the initial conditions of motion and in the selected assignment calculation schemes are estimated. It is shown that the main disturbing effects on the accuracy are due to density variations of the upper atmosphere. Recommendations are presented for estimating the calculation accuracy along with an example of such an estimate for the Interkosmos-7 artificial earth satellite. Other factors considered include the adopted scheme and computational algorithms used, effects of disturbing forces not taken into account earlier, and errors in the values of constants and in models of disturbing forces. Author

N75-21968* Kanner (Leo) Associates, Redwood City, Calif.
SOME PROCEDURES FOR COMPUTERIZED ELECTRONIC DATA PROCESSING OF ABSORPTION MEASUREMENTS FROM ARTIFICIAL EARTH SATELLITES c60
B. Trinkkeller *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 127-131 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 188-193 (For availability see N75-21952 13-59)
CSCL 09B

The processing of data obtained from solar absorption radiation measurements is discussed. The position of the satellite was obtained by numerical integration of the differential equations of motion using initial conditions. The position of the sun was calculated as a function of time, and the tangential elevation was determined approximately from the positions of the satellite and the sun. The coefficients of an approximation formula and of a data smoothing process were determined, and the inversion of an Abel integral equation is solved analytically. Author

N75-21969* Kanner (Leo) Associates, Redwood City, Calif.
ANALYTICAL METHOD FOR CALCULATION OF NAVIGATIONAL DATA FOR THE POSITION OF A SATELLITE c13
P. Lala *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 132-138 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 194-202 (For availability see N75-21952 13-59)
CSCL 22A

A method is described for calculating the position of a satellite at the instants when measurements are made on board. The initial conditions used were the mean orbital elements of the satellite and their time derivatives in one orbit. The results of the calculation are compared with those obtained by numerical integration, and it is found that results are identical at the beginning of an orbit, but change as the orbit progresses. The advantages and disadvantages of the analytical method are presented.
Author

N75-21970* Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF THE SATELLITE ATTITUDE AND ITS MOTION ABOUT THE CENTER OF MASS c13
I. G. Khatskevich *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 139-144 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 203-213 (For availability see N75-21952 13-59)
CSCL 22A

The algorithm requirements for the problem solving and factors determining the accuracy of the solution are analyzed. The types of telemetry data used and the models adopted for the satellite motion about the center of the mass are described. The scheme for the technique used to determine the attitude on the basis of magnetometer data is also discussed. Author

N75-21971* Kanner (Leo) Associates, Redwood City, Calif.
NEW METHODS FOR THE NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS AND THEIR APPLICATION TO THE EQUATIONS OF MOTION OF SPACECRAFT c13
A. Banyukevich and K. Ziolkovski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 145-151 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 214-223 (For availability see N75-21952 13-59)
CSCL 22A

A number of hybrid methods for solving Cauchy problems are described on the basis of an evaluation of advantages of single and multiple-point numerical integration methods. The selection criterion is the principle of minimizing computer time. The methods discussed include the Nordsieck method, the Bulirsch-Stoer extrapolation method, and the method of recursive Taylor-Steffensen power series. Author

N75-21972* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS IN THE LONG-TERM STORAGE OF DATA OBTAINED FROM SCIENTIFIC SPACE EXPERIMENTS c60
G. N. Zlotin and Yu. D. Khovanskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 152-156 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 224-232 (For availability see N75-21952 13-59)
CSCL 09B

It is shown that long-term data storage systems can be achieved when the system which organizes and conducts the scientific space experiments is equipped with a specialized subsystem: the information filing system. Its main functions are described along with the necessity of stage-by-stage development and compatibility with the data processing systems. The requirements for long-term data storage media are discussed.
Author

N75-21973* Kanner (Leo) Associates, Redwood City, Calif.
UP-TO-DATE STATE OF STORAGE TECHNIQUES USED FOR LARGE NUMERICAL DATA FILES c82
Vaclav Chlouba *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 157-174 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 233-253 (For availability see N75-21952 13-59)
CSCL 05B

Methods for data storage and output in data banks and memory files are discussed along with a survey of equipment available for this. Topics discussed include magnetic tapes, magnetic disks, Terabit magnetic tape memory, Unicon 690 laser memory, IBM 1360 photostore, microfilm recording equipment, holographic recording, film readers, optical character readers, digital data storage techniques, and photographic recording. The individual types of equipment are summarized in tables giving the basic technical parameters. Author

N75-21974* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATED STORAGE AND RETRIEVAL OF DATA OBTAINED IN THE INTERKOSMOS PROJECT c82
K. Ziolkovski and V. Pakholski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 175-179 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 257-265 (For availability see N75-21952 13-59)
CSCL 05B

The formation of a data bank and information retrieval system for scientific data is described. The stored data can be digital or documentation data. Data classification methods are discussed along with definition and compilation of the dictionary utilized, definition of the indexing scheme, and definition of the principles used in constructing a file for documents, data blocks, and tapes. Operating principles are also presented. M.J.S.

N75-21975* Kanner (Leo) Associates, Redwood City, Calif.
MAIN PRINCIPLES USED FOR BUILDING UP A DATA BANK FOR THE LONG-TERM STORAGE AND RETRIEVAL OF SCIENTIFIC SPACE DATA c82
G. N. Zlotin, A. B. Bykov, L. V. Roy, and Yu. D. Khovanskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 180-200 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 266-295 (For availability see N75-21952 13-59)
CSCL 05B

Methodological, technical, and practical organizational problems are considered of constructing a long term data bank. Data processing flowcharts are presented which are based on an analysis of the tasks which the data bank must fulfill, an estimate of the existing and predicted data flows in the processing center, and the selection of the data storage media and the forms in which the data are presented. Questions related to the use of standard and special hardware and software in the data bank are discussed. Reasons are presented for the adopted structure of the document-fact type information retrieval system which permits the mechanization and automation of various stages in the retrieval and selection of the data. Author

N75-21976* Kanner (Leo) Associates, Redwood City, Calif.
USE OF INFORMATION-RETRIEVAL LANGUAGES IN AUTOMATED RETRIEVAL OF EXPERIMENTAL DATA FROM LONG-TERM STORAGE c61
Yu. D. Khovanskiy and N. I. Kremneva *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 201-218 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 296-319 (For availability see N75-21952 13-59)
CSCL 09B

Problems and methods are discussed of automating information retrieval operations in a data bank used for long term storage and retrieval of data from scientific experiments. Existing information retrieval languages are analyzed along with those being developed. The results of studies discussing the application of the descriptive 'Kristall' language used in the 'ASIOR' automated information retrieval system are presented. The development and use of a specialized language of the classification-descriptive type, using universal decimal classification indices as the main descriptors, is described. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N75-21977 Minnesota Univ., Minneapolis.
THE CONFIGURATIONAL OPTIMIZATION OF COMPUTER SYSTEMS Ph.D. Thesis
Swatantra Kumar Kachhal 1974 180 p
Avail: Univ. Microfilms Order No. 75-2114

Analytic techniques are discussed which can be helpful in achieving macrolevel configurational optimization of computer systems. The scope of optimization includes the determination of the number of central processing units (CPU), main memory size, the types of auxiliary storages along with their sizes, and the number of channels at each auxiliary memory level. The management oriented variables explicitly included in the model are the level of multiprogramming and the main memory space allotted to each program. Other management oriented variables such as replacement algorithm and page size are implicitly included in the model through the shape of the operating characteristic curve and the input/output activity curve. The objective function used for optimization was the total system cost divided by the probability of CPU busy time. A queueing model was developed which evaluates the probability of CPU busy time for any given configuration. An optimization algorithm was developed which searches for the best system configuration; it is basically a direct search method where the direction of descent of the objective function at any base point was found by varying the associated variables together. Budgetary and response time constraints are included. Dissert. Abstr.

N75-21978 Missouri Univ., Columbia.
DEVELOPMENT OF A SOLID STATE REFRESH MEMORY TONAL DISPLAY Ph.D. Thesis
Theodore Eugene McCracken 1974 323 p
Avail: Univ. Microfilms Order No. 75-5765

The use of tonal displays in image analysis and interactive graphics has dictated the use of expensive refresh memories for the display output device. This has involved the use of high speed digital drums, multiple head discs, and analog storage tubes. Recently, the introduction of very long shift registers has allowed the designer to consider their use for refresh memories. A display using 1024 bit MOS static shift registers is developed. It is shown that a reasonable cost versus performance tradeoff can be obtained. The first effort resulted in a 128 X 128 X 4 bit (64k) memory; it is now in the process of being expanded to 256 X 256 X 8 bits (512k). This memory is cost competitive with digital disc memories and both cost and performance competitive with storage tube scan converters. Dissert. Abstr.

N75-21979 Utah Univ., Salt Lake City.
A SUBDIVISION ALGORITHM FOR COMPUTER DISPLAY OF CURVED SURFACES Ph.D. Thesis
Edwin Earl Catmull 1974 83 p
Avail: Univ. Microfilms Order No. 75-4786

A method is presented for producing computer shaded pictures of curved surfaces. Three-dimensional curved patches are used, as contrasted with conventional methods using polygons. The method subdivides a patch into successively smaller subpatches until a subpatch is as small as a raster-element, at which time it can be displayed. In general this method could be very time consuming because of the great number of sub-divisions that must take place; however, there is at least one very useful class of patches -- the bicubic patch -- that can be subdivided very quickly. Pictures produced with the method accurately portray the shading and silhouette of curved surfaces. In addition, photographs can be mapped onto patches thus providing a means for putting texture on computer-generated pictures.
Dissert. Abstr.

N75-21980*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DETAILED REQUIREMENTS DOCUMENT FOR THE PROBLEM REPORTING DATA SYSTEM (PDS)
R. S. West Feb. 1975 151 p
(Contract NAS9-12200)
(NASA-CR-141730; LEC-5549; JSC-09421) Avail: NTIS HC $6.25 CSCL 09B

The system is described as a computer-based system designed to track the status of problems and corrective actions pertinent to space shuttle hardware. The input, processing, output, and performance requirements of the system are presented along with standard display formats and examples. Operational requirements, hardware, requirements, and test requirements are also included. M.J.S.

N75-21981*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
MAIN MEMORY UNIT Final Report, Oct. 1973 - Apr. 1975
15 Apr. 1975 31 p ref
(Contract NAS8-30460)
(NASA-CR-120733; IBM-75W-000) Avail: NTIS HC $3.75 CSCL 09B

The development of a main memory unit (MMU) for the space ultrareliable module computer (SUMC) model HTC is discussed. The design, fabrication, and test of basic memory modules (BMM) which were to be used in the design and construction of the MMU are described. The BMM was designed from state-of-the-art technologies which included large scale integration devices mounted and interconnected on a substrate to form a functional module to be utilized in the MMU development. A SUMC memory system design study is discussed which addressed itself to the BMM design and analysis to be

conducted to determine the most efficient organization of the BMM in order to establish such modularity features as: word length expandability without redesign, high reliability, and fault tolerance. One MMU was designed, fabricated, tested, and delivered which will be electrical and mechanically compatible with the hybrid technology computer (HTC) model of the SUMC family of computers. The MMU will contain a storage capacity of 8196 36 bit words which includes a parity bit for each 8 bit byte of data. Author

N75-21982# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXCHANGE CIRCUITS BETWEEN BRANCHES OF PARALLEL ALGORITHMS
Yu G. Kosarev 6 Dec. 1974 12 p refs Transl. into ENGLISH from Vychisl. Sist. (USSR), no. 51, 1972 p 50-75
(AD-A002810; FTD-HT-23-249-75) Avail: NTIS CSCL 09/2

An experiment is described employing the method of parallel lay-out in cycles for a considerable number of problem classes. Calculation and direct measurements have shown the rate of information exchange between branches of a parallel algorithm with reference to the total calculation time expenditure for the majority of problems. M.C.F.

N75-21983# Emmanuel Coll., Boston, Mass.
STUDY OF HYDROMAGNETIC WAVE PROPAGATION IN THE MAGNETOSPHERE. 1: DESIGN AND FABRICATION OF DATA PROCESSING SYSTEM. 2: MATHEMATICAL ANALYSIS OF MAGNETOSPHERIC MODELS
M. Patricia Hagan Aug. 1974 53 p
(Contract F19628-73-C-0081; AF Proj. 7601)
(AD-A003394; SR-1; AFCRL-TR-74-0449) Avail: NTIS CSCL 09/2

This report provides a guide to the understanding of the operation of the mini-computer which is currently under development and testing, in preparation for the operation of the micropulsation network. GRA

N75-21953* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIENCE GAINED ON IBM 360 COMPUTER IN THE PRELIMINARY PROCESSING OF TELEMETRY DATA RECORDED ON MAGNETIC TAPE
K. Bratkovska *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 1-2 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 1-3 (For availability see N75-21952 13-59)
CSCL 09B

N75-21954* Kanner (Leo) Associates, Redwood City, Calif.
COMPUTERIZED PROCESSING OF DATA FROM INTERKOSMOS-7 AND INTERKOSMOS-8 SATELLITE EXPERIMENTS
H. Pfau *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 3-7 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 4-11 (For availability see N75-21952 13-59)
CSCL 09B

N75-21955* Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY DATA PROCESSING SYSTEM FOR TELEMETRY DATA FROM INTERKOSMOS-8 TYPE SATELLITES
A. S. Vilchinskaya and V. M. Pokras *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 8-12 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 12-20 (For availability see N75-21952 13-59)
CSCL 09B

N75-21957* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIENCE GAINED FROM COMPUTER PROCESSING OF PHYSICAL EXPERIMENTAL DATA DURING THE RESTORATION OF MEASURED VALUES
Z. N. Mamotko and L. I. Shatrovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 17-33 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 29-57 (For availability see N75-21952 13-59)
CSCL 09B

N75-21962* Kanner (Leo) Associates, Redwood City, Calif.
PHOTOTELEVISION DATA DISPLAY METHODS
G. A. Avanesov, I. V. Barinov, and V. D. Glazkov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 68-80 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 105-124 (For availability see N75-21952 13-59)
CSCL 09B

N75-21963* Kanner (Leo) Associates, Redwood City, Calif.
A SYSTEM FOR THE INPUT AND STORAGE OF DATA IN THE BESM-6 DIGITAL COMPUTER
K. Schmidt and L. Blenke *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 81-85 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 125-131 (For availability see N75-21952 13-59)
CSCL 09B

N75-21964* Kanner (Leo) Associates, Redwood City, Calif.
CONSTRUCTION OF THE IMAGE OF A FUNCTION OF TWO VARIABLES USING PHOTOTELEVISION DISPLAYS
A. A. Fomenko *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 86-94 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 132-143 (For availability see N75-21952 13-59)
CSCL 09B

N75-21965* Kanner (Leo) Associates, Redwood City, Calif.
THE PROBLEM OF THE MAN-SPACE DATA INTERFACE DURING COMPUTER PROCESSING OF DATA
Z. N. Mamotko and V. S. Mokrov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 95-103 ref Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 144-154 (For availability see N75-21952 13-59)
CSCL 09B

N75-21968* Kanner (Leo) Associates, Redwood City, Calif.
SOME PROCEDURES FOR COMPUTERIZED ELECTRONIC DATA PROCESSING OF ABSORPTION MEASUREMENTS FROM ARTIFICIAL EARTH SATELLITES
B. Trinkkeller *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 127-131 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 188-193 (For availability see N75-21952 13-59)
CSCL 09B

N75-21972* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS IN THE LONG-TERM STORAGE OF DATA OBTAINED FROM SCIENTIFIC SPACE EXPERIMENTS
G. N. Zlotin and Yu. D. Khovanskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 152-156 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 224-232 (For availability see N75-21952 13-59)
CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-21984 Virginia Polytechnic Inst. and State Univ., Blacksburg.
DESIGN AND IMPLEMENTATION OF A HYBRID COMPUTER PROGRAMMING LANGUAGE Ph.D. Thesis
Michael Jack Batchelder 1975 389 p
Avail: Univ. Microfilms Order No. 75-3462

The hybrid programming language (HPL) is described as a general-purpose real-time language implemented for hybrid computer programming. HPL has all arithmetic and data manipulation operations in addition to character and bit string manipulation. Included are the real-time capabilities of interrupt control, multitasking, time delay and execution scheduling. Hybrid I/O capabilities include analog to digital, digital to analog, and digital to digital. Stream and record I/O are both available for standard peripherals. Mode testing and mode setting were provided for the analog computer. Since execution efficiency is of prime consideration, HPL has built-in functions for direct access to the hardware which include extensive bit manipulation and testing functions, and the ability to mix in machine instructions. Debugging aids are built into the compiler which executes off-line on the IBM 370 producing code for the GE 4020.
Dissert. Abstr.

N75-21985 Texas Univ., Austin.
ANALYSIS OF SEQUENCING IN COMPUTER PROGRAMS AND SYSTEMS Ph.D. Thesis
William Preston Alexander, III 1974 94 p
Avail: Univ. Microfilms Order No. 75-4313

Methods were developed for determining the orders in which a computer program performs its operations, and for verifying from its source code whether a program adheres to any given sequencing rule. These methods are based on analysis of the program's state graph, and techniques are presented for compressing the graph to eliminate unnecessary detail and for expanding it to add necessary distinctions. A program is described which automates most of these methods and which was used to analyze parts of a real operating system. The methods were extended to apply to systems of parallel processes. Systems are modeled as state graphs and analyzed for the order in which they perform operations as well as for blockage properties such as deadlock.
Dissert. Abstr.

N75-21986 New Mexico Univ., Albuquerque.
ANALYTICAL STATE ASSIGNMENT FOR SYNCHRONOUS SEQUENTIAL MACHINES Ph.D. Thesis
Min-Hung Chao 1974 132 p
Avail: Univ. Microfilms Order No. 75-6962

An algorithm is proposed that solves the internal state assignment, input state assignment, and output circuit simplification problems of synchronous sequential machines. With few modifications, it can be applied to machines using various types of memory elements and is capable of solving the state assignment problems of large sequential machines. The algorithm is first presented in a form for use on machines realized with D-type flip-flops; it is then generalized so that it can be applied to machines using trigger, S-R, or J-K flip-flops directly. The features of merit in a state table that could be used to obtain internal state assignments with reduced dependency are investigated. Methods to find two-block partitions that possess these features in a state table are suggested, and the value of each feature in the internal state assignment is defined. Necessary modifications to generalize the algorithm are described, and comparisons of 11 states solved by use of the algorithm and other published techniques are made.
Dissert. Abstr.

N75-21987*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
A COMPUTER PROGRAM FOR TWO-DIMENSIONAL AND AXISYMMETRIC NONREACTING PERFECT GAS AND EQUILIBRIUM CHEMICALLY REACTING LAMINAR, TRANSITIONAL AND-OR TURBULENT BOUNDARY LAYER FLOWS
E. W. Miner, E. C. Anderson, and Clark H. Lewis May 1971 191 p refs
(Contract NAS1-9337)
(NASA-CR-132601; VPI-E-71-8) Avail: NTIS HC $7.00 CSCL 09B

A computer program is described in detail for laminar, transitional, and/or turbulent boundary-layer flows of non-reacting (perfect gas) and reacting gas mixtures in chemical equilibrium. An implicit finite difference scheme was developed for both two dimensional and axisymmetric flows over bodies, and in rocket nozzles and hypervelocity wind tunnel nozzles. The program, program subroutines, variables, and input and output data are described. Also included is the output from a sample calculation of fully developed turbulent, perfect gas flow over a flat plate. Input data coding forms and a FORTRAN source listing of the program are included. A method is discussed for obtaining thermodynamic and transport property data which are required to perform boundary-layer calculations for reacting gases in chemical equilibrium.
Author

N75-21988# Defence Scientific Information Service, Ottawa (Ontario). Automated Information Processing Section.
INPLEMENTATION OF A MINI-COMPUTER BASED INFORMATION SYSTEM. PART 18, A GENERAL FILE DUMP PROGRAM FOR THE VARIAN 620 COMPUTER
G. W. Plunkett Jan. 1975 53 p refs
(DSIS-TM-1/75(DIP)) Avail: NTIS HC $4.25

The implementation is discussed of a minicomputer based information system which requires the development of a convenient, easy-to-use systems program, which can aid the operator or programmer in diagnosing programming bugs or machine failures. A multipurpose utility program called the tape dump and utility monitor (TDUM) program is presented which is tailored around the data analysis requirements at DSIS, but would be advantageous to any installation which has a Varian computer and external storage equipment. TDUM is written in Varian DAS ASSEMBLER language and requires the Varian master operating system package. The purpose and logic behind the various TDUM routines were examined. Flowcharts and examples of input requests and various types of output dumps are included.
Author

N75-21989*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
EVALUATION OF A DATA DICTIONARY SYSTEM
W. G. Driggers Mar. 1975 53 p refs
(Contract NAS9-12200)
(NASA-CR-141763; LEC-5687; JSC-09446) Avail: NTIS HC $4.25 CSCL 09B

The usefulness was investigated of a data dictionary/directory system for achieving optimum benefits from existing and planned investments in computer data files in the Data Systems Development Branch and the Institutional Data Systems Division. Potential applications of the data catalogue system are discussed along with an evaluation of the system. Other topics discussed include data description, data structure, programming aids, programming languages, program networks, and test data.
M.J.S.

N75-21990# California Univ., Livermore. Lawrence Livermore Lab.
RQGPAK: A PACKAGE OF FORTRAN SUBPROGRAMS TO COMPUTE MACROSCOPIC PROPERTIES OF RELATIVISTIC QUANTUM BASES
J. P. Vajk Nov. 1974 21 p
(Contract W-7405-eng-48)
(UCID-16660) Avail: NTIS HC $3.25

The theory of relativistic gases of particles obeying Bose-Einstein, Fermi-Dirac, or Maxwell-Boltzmann statistics is reviewed briefly. A package of FORTRAN subprograms which compute the macroscopic thermodynamic properties of such gases for arbitrary nonvanishing densities and temperatures (provided the independent particle model is applicable) is then described. These are especially useful for astrophysical problems in which particle-antiparticle pairs must be correctly treated.
Author (NSA)

N75-21991# Atomic Weapons Research Establishment, Aldermaston (England).

SIMLA USER'S MANUAL
A. Yerkess Sep. 1974 130 p refs
(AWRE-O-36/74) Avail: ERDA Depository Libraries HC $9.50; HMSO £2.50; PHI $9.90

A description is given of SIMLA (SIMple LAgrangian) the computer program that may be used to solve the Lagrangian equations of motion for one-dimensional unsteady compressible fluid flow in plane, cylindrical, or spherical geometry. The forms of equations of state that may be considered are also described. Author (NSA)

N75-21992# Pattern Analysis and Recognition Corp., Rome, N.Y.
HYBRID FEATURE EXTRACTION SOFTWARE, VOLUME 1 Final Report, Apr. 1973 - May 1974
Paul J. Caruso Nov. 1974 104 p 3 Vol.
(Contract F30602-73-C-0242; AF Proj. 5597)
(AD-A003283; PAR-74-12-Vol-1; RADC-TR-74-262-Vol-1) Avail: NTIS CSCL 09/2

The Hybrid Feature Extraction Software System derives digital feature vector information in real time from raw analog input data. The output medium is either magnetic tape or disk pack formatted to be compatible with the OLPARS system. The system has been constructed in a modular fashion to allow for future expansion (i.e., additional feature extractors, data reformatting, etc.). The equipment used includes a Digital Equipment Corporation PDP 11/45 digital computer and an Applied Dynamics A/D-5 analog hybrid computer. GRA

N75-21993# Pattern Analysis and Recognition Corp., Rome, N.Y.
HYBRID FEATURE EXTRACTION SOFTWARE. VOLUME 2: FESS FLOW CHARTS Final Report, Apr. 1973 - May 1974
Paul J. Caruso Nov. 1974 398 p 3 Vol.
(Contract F30602-73-C-0242; AF Proj. 5597)
(AD-A003284; PAR-74-12-Vol-2; RADC-TR-74-262-Vol-2) Avail: NTIS CSCL 09/2

The report contains flow charts and subroutines for the FESS (Feature Extraction Software System). GRA

N75-21994# Pattern Analysis and Recognition Corp., Rome, N.Y.
HYBRID FEATURE EXTRACTION SOFTWARE. VOLUME 3: FESS FLOW CHARTS Final Report, Apr. 1973 - May 1974
Paul J. Caruso Nov. 1974 396 p 3 Vol.
(Contract F30602-73-C-0242; AF Proj. 5597)
(AD-A003285; PAR-74-12-Vol-3; RADC-TR-74-262-Vol-3) Avail: NTIS CSCL 09/2

The Hybrid Feature Extraction Software System (FESS) derives digital features vector information in real time from raw analog input data. This volume contains FESS flow charts. GRA

N75-21995# System Development Corp., Santa Monica, Calif.
INTERACTIVE SYSTEMS RESEARCH Final Report, 1 Oct. 1973 - 15 Sep. 1974
M. L. Bernstein 15 Nov. 1974 43 p refs
(Contract DAHC15-73-C-0080; ARPA Order 2254)
(AD-A003034; SDS-TM-5243/002/00) Avail: NTIS CSCL 05/7

The program presently includes three projects: (1) Speech Understanding Research, (2) Lexical Data Archive, and (3) Common Information Structures. The overall intent of SDC's ISR program is to develop basic technology for improved man-machine interactive systems with application to a variety of anticipated military needs. The major emphasis at present is on speech understanding and related problems. GRA

N75-21996# Texas Univ., Austin. Center for Cybernetic Studies.
AN ALGORITHM FOR SOLVING INTERVAL LINEAR PROGRAMMING PROBLEMS
A. Charnes, Frieda Granot, and F. Phillips Nov. 1974 25 p refs Revised
(Contracts N00014-67-A-0126-0008; N00014-67-A-01260009; NR047021)
(AD-A002995; CCS-206) Avail: NTIS CSCL 12/2

This paper presents an algorithm for solving interval linear programming problems. The algorithm is a finite iterative method, which in each iteration solves a full row rank interval linear programming problem, with only one additional constraint. The solution and/or problem chosen appears to be computationally more efficient than that in the Ben-Israel and Robers algorithm. GRA

N75-21997# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
COMPUTER LISTINGS FOR ILLIAC 4 VERSION OF FKCOMB
Ann Kerr and Gene Wagenbreth 6 Nov. 1974 76 p
(Contract F08606-74-C-0006; ARPA Order 1620)
(AD-A002976; SDAC-TR-74-18) Avail: NTIS CSCL 09/2

This is the third report in a series of three published at the Seismic Data Analysis Center in 1974, which describe studies of and programming experience with the ILLIAC IV computer. The present report is a computer listing of the ILLIAC IV version of a scientific program called FKCOMB. The main program, FKCOMB, and two data-editing and formatting modules, DEM1 and DEM2 were written in Computational Fluid Dynamics Code (CFD); some subroutines were written in ASK code. GRA

N75-21998# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SYMBOLANG: A SLIP EXTENSION FOR ALGEBRAIC MANIPULATION
M. A. Hirschberg Nov. 1974 28 p refs
(DA Proj. 1T6-62618-AH-80)
(AD-A003190; BRL-1749) Avail: NTIS CSCL 09/21

SYMBOLANG, originally developed by A. Lapidus, M. Goldstein, S. Hoffberg, and expanded by H. Bernstein, S. Greenspan, A. Magnus, and others is a collection of FORTRAN-callable subroutines which can perform arithmetic operations (addition, subtraction, multiplication, division, etc.), substitutions, evaluations, and differentiations on expressions represented as SLIP lists. SYMBOLANG consists of seventy-two subprograms and is operational on the BRLESC 2 computer. GRA

N75-21999# Aerospace Corp., El Segundo, Calif.
SOFTWARE FOR THE VARIAN STATOS 31 PLOTTER OFFLINE TO THE CDC 3600/3800 AND CDC 6 Final Report, 1 Jan. 1973 - 6 Sep. 1974
R. J. Mercer and C. S. Irons 12 Sep. 1974 66 p
(Contracts F04701-73-C-0074; F04701-74-C-0075)
(AD-A003407; TR-0074(4730)-1; SAMSO-TR-73-385) Avail: NTIS CSCL 09/2

Software in the form of basic subroutines and a utility program, used for the generation of offline plots on a Varian Statos 31 electrostatic plotter, is described. The utility program plots from data files that may be on cards or magnetic tape. All coding is in FORTRAN; versions have been executed on the CDC 3600/3800 and 6000 series computers. GRA

N75-22000# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE SYSTEMIZATION AND EVALUATION OF THE RESULTS OF COMPUTER TESTS ON RELIABILITY WITH CONSIDERATION OF SHORT-DURATION FAILURES
P. G. Gaganov 18 Nov. 1974 13 p refs Transl. into ENGLISH from Nadezhnost i Kontrol Kachestva (USSR), no. 8, 1972 p 28-33
(FTD Proj. T74-05-12)
(AD-A002818; FTD-HT-23-0041-75) Avail: NTIS CSCL 09/2

It was found that the ability of a computer to work without short-duration failures during a given time interval characterized the stability of the computer operation, while the ability of the computer control system and its program to resist the effect of short-duration failures in the problem solving process characterized resistance to short-duration failures. Other topics discussed include central processing units, reliability, and failure analysis. M.J.S.

N75-22001# Mitre Corp., Bedford, Mass.
EXPERIENCES WITH AN OPERATIONAL ASSOCIATIVE PROCESSOR
D. I. Baldauf Nov. 1974 37 p refs
(Contract F19628-73-C-0001)

(AD-A003414; MTR-2879; ESD-TR-74-199) Avail: NTIS CSCL 09/2

A space object position prediction program was implemented on the STARAN associative array processor (AP) installed at the Rome Air Development Center (RADC), New York. This document outlines the experience gained from this task. A section is devoted to an analysis of the time and effort required to implement the program. Emphasis is given to the program design and array layout phase. Systematic (i.e., independent of the specific program) and application-related capabilities and limitations are discussed. An analysis of the RADCAP system from a user's viewpoint is also presented. The latter part of the paper deals with recommendations for an approved STARAN system (hardware and software) and an improved host computer interface. GRA

N75-22002# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A QUADRATIC PROGRAMMING ALGORITHM WHICH USES GENERALIZED INVERSES M.S. Thesis
David R. Czaplicki Dec. 1974 93 p refs
(AD-A003355; GSA/SM/74D-2) Avail: NTIS CSCL 12/2

An algorithm for solving quadratic programming problems is described in this study. A quadratic programming problem here is defined as finding the maximum of a quadratic function of several variables where the variables are subject to linear equality and inequality constraints. The quadratic function is restricted to be strictly concave. The algorithm uses generalized inverses of matrices to sort through the constraints in order to find quickly the set of constraints that is binding in the final solution. The algorithm is then compared to other existing quadratic programming algorithms. GRA

N75-21960* Kanner (Leo) Associates, Redwood City, Calif.
PROGRAMMING LANGUAGE FOR COMPUTATIONS IN THE INTERKOSMOS PROGRAM
K. Schmidt *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-16164) Apr. 1975 p 49-56 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 80-90 (For availability see N75-21952 13-59)
CSCL 09B

N75-21976* Kanner (Leo) Associates, Redwood City, Calif.
USE OF INFORMATION-RETRIEVAL LANGUAGES IN AUTOMATED RETRIEVAL OF EXPERIMENTAL DATA FROM LONG-TERM STORAGE
Yu. D. Khovanskiy and N. I. Kremneva *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 201-218 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 296-319 (For availability see N75-21952 13-59)
CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N75-22003 Wisconsin Univ., Madison.
DESIGN OF PROGRAMMABLE PARALLEL DATA ROUTING NETWORKS VIA CROSS BAR SWITCHES FOR A DYNAMIC DIGITAL COMPUTER Ph.D. Thesis
Cheng-Jen Chen 1974 220 p
Avail: Univ. Microfilms Order No. 74-22108

A theoretical study was made of the problem of designing programmable parallel data routing networks (PDRN) via cross-bar switches for a dynamic digital computer (DDC). Such a computer is specifically designed for solving differential equations, which describe the dynamics of a wide variety of systems, in a parallel fashion. This investigation emphasized the reduction of the number of switches by using the availability of a priori knowledge of interconnections, the interchangeability of CU's, and triangular PDRN's (TPDRN). A concentrated effort was made to develop route finding algorithms for the proposed PDRN's. Two such algorithms were formulated for a TPDRN and a RPDRN, respectively. It was also found that the only problem encountered in formulating route finding algorithms for 3-stage PDRN's was the assignment of middle blocks. Finally, several design considerations were presented. This includes the worst case propagation delays and development of set-up algorithms of the PDRN's, solutions to the multiple input and output problem of a CU, and the word-to-word data routing problem in a DDC.
Dissert. Abstr.

N75-22004# Joint Publications Research Service, Arlington, Va.
COMPUTERS AND THE SOVIET ECONOMY
D. Chevignard 3 Apr. 1975 13 p Transl. into ENGLISH from Def. Natl. (Paris), Feb. 1975 p 117-128
(JPRS-64479) Avail: NTIS HC $3.25

Soviet developments in the application of electronic data processing techniques and computers to economic management are described. It is indicated that the effort to computerize the Soviet economy is plagued by inadequate equipment resources and a shortage of data processing, organizational, and research experts. J.M.S.

N75-22005# Mound Lab., Miamisburg, Ohio.
CASE STUDY: MANUFACTURING DATA BASE STRUCTURES
E. Depew, J. Gondert, and L. Karcher 7 Nov. 1974 35 p refs
(Contract AT-33-1-GEN-53)
(MLM-2189(OP)) Avail: NTIS HC $3.75

The use of the COPICS system as a physical data base design guide at Mound Laboratory is described. The way in which the data bases can be extended and redefined by logical views and user integration problems are discussed. The application established four physical data bases: warehouse, vendor, current purchase order, and purchase order history. NSA

N75-22006# Oak Ridge National Lab., Tenn.
LISTING OF ORCHIS DATA BASES
R. Slusher and A. A. Brooks Dec. 1974 55 p refs
(Contract W-7405-eng-26)
(UCCND-CSD-INF-14) Avail: NTIS HC $4.25

A listing and indices are presented to the several data bases that were processed by the ORCHIS system and documented with the computing applications department by the user. It is expected that the report will make the existence of the data bases known to potential UCC-ND users, and prompt other data base holders to submit documentation of their data bases for inclusion in future listings. A current version of this data is mounted on-line for searching with ORLOOK. NSA

N75-22007# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
INTERFACE MESSAGE PROCESSORS FOR THE ARPA COMPUTER NETWORK Quarterly Technical Report, 1 Jan. - 31 Mar. 1974
Frank E. Heart Apr. 1974 25 p
(Contract F08606-73-C-0027)
(AD-A002700; BBN-2816; QTR-5) Avail: NTIS CSCL 09/2

The ARPA computer network provides a communication medium which allows dissimilar computers (Hosts) to interchange information. Each Host is connected to an Interface Message Processor (IMP), and IMPs are interconnected by leased common carrier circuits. There is frequently no direct circuit between two communicating Hosts, and the intermediate IMPs store and forward the information. IMPs regularly exchange information which is used to adapt routing to changing network conditions. IMPs also report a variety of parameters to a Network Control Center, which coordinates diagnosis and repair of malfunctions. The Terminal IMP (TIP) permits the direct attachment of 63 character-oriented terminals. The Satellite IMP (SIMP) will allow multi-station use of a single earth satellite channel. A High Speed Modular IMP (HSMIMP) is under development; one goal of this effort is to increase IMP performance by an order of magnitude. GRA

N75-22008# Illinois Univ., Urbana. Dept. of Computer Science.
PRUNING PROCEDURES FOR NOR NETWORKS USING

PERMISSIBLE FUNCTIONS (PRINCIPLES OF NOR NETWORK TRANSDUCTION PROGRAMS NETTRA-PG1, NETTRA-P1, AND NETTRA-P2)
J. N. Culliney, H. C. Lai, and Y. Kambayashi Nov. 1974 55 p refs
(Grant NSF GJ-40221)
(PB-238149/9; UIUCDCS-R-74-690) Avail: NTIS HC $4.25 CSCL 09B

Three procedures of the 'pruning' class of transduction procedures for NOR network design by network transformation are discussed. The procedures are based, respectively, on the concepts of 'compatible sets of permissible functions,' 'O-fixed maximum sets of permissible functions' for connections, and '1-fixed maximum sets of permissible functions' for gates (CSPF's, OFMSPF's, and 1FMSPF's). Use of the latter two guarantees single-irredundant networks. GRA

N75-22009# Illinois Univ., Urbana. Dept. of Computer Science.
PROGRAM MANUAL: NOR NETWORK PRUNING PROCEDURES USING PERMISSIBLE FUNCTIONS (REFERENCE MANUAL OF NOR NETWORK TRANSDUCTION PROGRAMS NETTRA-PG1, AND NETTRA-P2)
H. C. Lai and J. N. Culliney Nov. 1974 132 p refs
(Grant NSF GJ-40221)
(PB-238150/7; UIUCDCS-R-74-686) Avail: NTIS HC $5.75 CSCL 09B

This is a reference manual for NOR network transduction programs NETTRA-PG1, NETTRA-P1, and NETTRA-P2 which prune connections in a given network, without creating new connections, according to the principles discussed in a previous paper by the authors and Y. Kambayashi. Networks produced by these programs are always subnetworks of the originally given networks. GRA

N75-22010# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
UNIFIED SYSTEM OF ELECTRONIC COMPUTERS
23 Dec. 1974 43 p Transl. into ENGLISH from Yedinaya Sistema Elektronnykh Vychislitelitelnykh Mashin, Rept. 6-901-0390-73, Enclosure no. 7, 1972 p 3-34
(AD-A002968; FTD-HC-23-87-75; Rept-6-901-0390-73) Avail: NTIS CSCL 09/2

The Unified Electronic Computer System (UECS) is a complex of third generation computers, designed to solve a wide assortment of scientific-technical, economic, and control problems. The modular structure and design of the UECS, as well as an elaborate system for the standardized coupling of the central unit and peripheral devices, permits the user to select the configuration of the actual machine in exact accordance with the requirements of the problems solved and with allowance for system development in the future. New peripheral devices may easily be added to the existing system or the replacement of the processor with a more powerful one carried out. GRA

N75-22011# SIA, Inc., Glen More, Pa.
SPACE PROGRAMMING LANGUAGE MACHINE (SPLM) LOGIC SIMULATOR. VOLUME 1 Final Report, Apr. 1972 - Dec. 1973
Alain P. Grebert, Robert V. Bock, Frederick H. Gerbstadt, and George A. Anderson Mar. 1974 73 p refs Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn. 3 Vol.
(Contract F04701-72-C-0209)
(AD-A002798; SAMSO-TR-74-26-Vol-1) Avail: NTIS CSCL 09/2

This document reports the results of the second phase work on the Space Programming Language Machine (SPLM) for the Air Force Space and Missile Systems Organization. The report consists of an introduction and discussion of the philosophy, development, and results of the SPLM work and of a specification for the SPLM Clock Level Simulator (CLS) Program. As a specification, this document establishes the requirements for complete identification of the CLS, to be formally accepted by the procuring activity. GRA

N75-22012# SIA, Inc., Glen More, Pa.
SPACE PROGRAMMING LANGUAGE MACHINE (SPLM) LOGIC SIMULATOR, VOLUME 2 Final Report, Apr. 1972 - Dec. 1973
Alain P. Grebert, Robert V. Bock, Frederick H. Gerbstadt, and George A. Anderson Mar. 1974 329 p Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn. 3 Vol.
(Contract F0471-72-C-0209)
(AD-A002799; SAMSO-TR-74-26-Vol-2) Avail: NTIS CSCL 09/2

This section contains the documentation of the SPLM model as expressed in the CLS text language. The documentation was generated, using the aids described in the appendices, from back-translations of the APL form of the model to the Text form. GRA

N75-22013# SIA, Inc., Glen More, Pa.
SPACE PROGRAMMING LANGUAGE MACHINE (SPLM) LOGIC SIMULATOR, VOLUME 3 Final Report, Apr. 1972 - Dec. 1973
Alain P. Grebert, Robert V. Bock, Frederick H. Gerbstadt, and George A. Anderson Mar. 1974 292 p Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn. 3 Vol.
(Contract F04701-72-C-0209)
(AD-A002800; SAMSO-TR-74-26-Vol-3) Avail: NTIS CSCL 09/2

Because of the nature of the SPLM design approach, rather large amounts of textual information were developed. A set of design support software devoted to the maintenance of these data was created. These support packages not only have enabled the design team to have accurate information at all times, but have allowed systematic changes to be made with great accuracy and speed (as compared to manual data base maintenance procedures). The support software has been broken down into the CLS Text Translator, File Handling Routines, Dictionary Routines, and the Function Handling, Sorting and Cross Referencing Functions. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N75-22014 Tennessee Univ., Knoxville.
THE DESIGN AND APPLICATION OF A DISCRETE PREDICTIVE DEAD TIME COMPENSATOR FOR DIRECT DIGITAL CONTROL Ph.D. Thesis
James Edward Doss 1974 152 p
Avail: Univ. Microfilms Order No. 75-3586

The effectiveness and applicability of a type of discrete predictive dead time compensation in direct digital control was examined. The discrete compensator techniques implemented were based on generalized first-order and second-order pulse transfer functions and a discrete PI controller was used as a basis for comparison. Step response data were obtained from a water-temperature control system consisting of two well-stirred insulated tanks in series connected by an adjustable dead time manifold. A medium size process control computer, the PDP 15/35, was used for open-loop data acquisition and process modeling as well as to execute the three control schemes under consideration. A type of least squares regression, in conjunction with Steiglitz-McBride iterative prefiltering, was utilized to obtain the model pulse transfer function coefficients and dead time. Gauss' reduction technique with partial pivoting was found to be adequate for solving the systems of linear equations arising from the least squares regression formulation. Dissert. Abstr.

N75-22015 Polish Academy of Sciences, Warsaw.
METHOD OF TRANSITION ACROSS ZERO IN ANALYSIS OF SPEECH SIGNAL AND IN AUTOMATIC RECOGNITION OF LIMITED SET OF TERMS [METODA PRZEJSC PRZEZ ZERO W ANALIZIE SYGNALU MOWY I AUTOMATYCZYM ROZPOZNAWANIU OGRANICZONEGO ZBIORU WYRAZOW]
Ryszard Gubrynowicz 1974 111 p refs In POLISH
(Rept-37/1974) Avail: Issuing Activity

A method is proposed for analyzing phonetic-acoustic speech

signals and for automatic recognition of pertinent information in the signal. Conditions were determined under which explicit connections exist between spectral parameters of the speech signal and the density of the transition across zero. The accuracy of the method was analyzed for determining the frequency of the first two formants. Transl. by M.J.S.

N75-22016 Pennsylvania Univ., Philadelphia.
COMPUTER RECOGNITION AND DESCRIPTION OF NATURAL SCENES Ph.D. Thesis
Lawrence Isaac Lieberman 1974 143 p
Avail: Univ. Microfilms Order No. 75-2756

A method is described for computer analysis of photographs of natural, outdoor scenes: a description of the objects in the scene, and their spatial relationships in real-world (three-dimensional) terms. The method deduces a three-dimensional object interpretation from the image data rather than simply segmenting the scene and assigning names to segments. The technique employs a world model for outdoor scenes, called the scene model, which associates sets of attributes with object concepts and contains relationships among the concepts. The scene model consists of two-dimensional, image attributes as implied by the 3-D world model, the observer's viewpoint, the illumination conditions, and the general environmental state. A higher level control program with a general strategy for the class of outdoor scenes uses low-level picture operators to make measurements on the image. A powerful texture descriptor employing a Fourier operator was developed. Dissert. Abstr.

N75-22017# Texas Univ., Austin. Center for Cybernetic Studies.
ON A CHARACTERIZATION OF OPTIMALITY IN CONVEX PROGRAMMING
A. Ben-Israel and A. Ben-Tal Oct. 1974 18 p refs Prepared in cooperation with Technion - Israel Inst. of Tech., Haifa
(Contracts N00014-67-A-0126-0008;
N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-A002959; CCS-196) Avail: NTIS CSCL 12/2

Necessary and sufficient conditions for optimality are given, for convex programming problems, without constraint qualification, in terms of a single mathematical program, which can be chosen to be bilinear. GRA

N75-22018# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
NATURAL COMMUNICATION WITH COMPUTERS. VOLUME 1. SPEECH UNDERSTANDING RESEARCH AT BBN Final Report, Oct. 1970 - Dec. 1974
William A. Woods, Madeleine A. Bates, Bertram C. Bruce, John J. Colarusso, and Craig C. Cook Dec. 1974 284 p refs
(Contract DAHC15-71-C-0088; ARPA Order 1697)
(AD-A003315; BBN-2976) Avail: NTIS CSCL 05/7

The report covers the development of the BBN speech project over the last four years from its early beginnings as part of the natural language understanding research at BBN prior to the inception of the ARPA Speech Understanding Project. At this point, the project is in the middle of the 5-year program projected by the ARPA Speech Understanding Research Steering Committee. This report is a final report on the first phase of this project and marks the transition of the Speech Project from a part of a larger contract on Natural Communications with Computers to a separate contract of its own. GRA

N75-22019# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
PROCEEDINGS OF THE SYMPOSIUM ON AIR FORCE APPLICATIONS OF MODERN CONTROL THEORY
David R. Audley and Kenneth D. Herring Jul. 1974 552 p refs Symp. held at Wright-Patterson AFB, Ohio, 9-11 Jul. 1974
(AF Proj. 7071)
(AD-A003387; ARL-74-1060) Avail: NTIS CSCL 12/1

The purpose of this symposium was to bring together DoD personnel involved in the application of modern control theory to Air Force Systems. Modern Control Theory was defined by the sponsors to include at least the following technical areas: estimation theory, linear and nonlinear system theory, control theory (including classical design and optimal techniques), modeling, identification, time series analysis, and the numerical methods in these areas. GRA

N75-22020# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONSTRUCTION OF GENERALIZED LOGICAL MODEL OF AUTOMATS WITH MEMORY
V. I. Kaznacheev and N. P. Muravyev 20 Nov. 1974 18 p refs Transl. into ENGLISH from the mono "Vychislitelnaya Teknhika v Mashinostroenii" Minsk, 1970 p 23-30
(AD-A003022; FTD-HC-23-2870-74) Avail: NTIS CSCL 09/2

An analytical method of constructing a generalized logical model (m-k) of polar synchronic and asynchronic automats with memory is presented. The possibilities of using it during the construction of tests, procedures of control and for the diagnosis of inaccuracies are also examined. A method of solving these problems with the help of generalized logic model is described. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-22021 Polish Academy of Sciences, Warsaw.
THE PECULIAR CASE OF REPRESENTING A PROFILE PAIR ON A CIRCUMFERENCE PAIR [O SZCZEGOLNYM PRZYPADKU ODWZOROWANIA PARY PROFILOW NA PARE OKREGOW]
Wlodzimierz J. Prosnak 23 Sep. 1973 78 p refs In POLISH
(Rept-2/1973) Avail: Issuing Activity

A method is presented for determining a function representing a pair of given profiles, symmetrical relative to the real axis, on a pair of circumferences. Two computer programs are presented in ALGOL-1204 programming language. The first enables automatic calculation of coefficients of a series, and the second controls the accuracy of the obtained representations. Transl. by M.J.S.

N75-22022 Texas Univ., Austin.
OPERATIONAL IMPROVEMENTS FOR THE PERTURBATION METHOD Ph.D. Thesis
Rodney Loren Bown 1974 101 p
Avail: Univ. Microfilms Order No. 75-4330

The operation and convergence of the perturbation method was investigated for the solution of the nonlinear two point boundary value problem. The convergence to the correct values of the missing initial conditions of several first order correction procedures are compared. A second order correction method is derived for the free final time problem. Numerical results were obtained for the two dimensional low thrust transfer trajectory between the heliocentric Earth and Mars orbits. Excellent convergence characteristics were achieved for the first order percent correction procedure. The second order correction procedure achieves better convergence but requires more computer time and storage. Numerical partial derivatives provide sufficient accuracy to obtain the same convergence as that of analytical derivatives. The numerical derivatives were easier to use and require less computer time. Dissert. Abstr.

N75-22023# Research Inst. of National Defence, Stockholm (Sweden).
SUPPLEMENT TO REPORT ON MODIFIED LINEAR MULTISTEP METHODS FOR A CLASS OF STIFF ORDINARY DIFFERENTIAL EQUATIONS
Gunnar Bjurel Nov. 1972 20 p ref
(FOA-2-C-2572-M4) Avail: NTIS HC $3.25

A proof of lemma 2 is presented along with an estimate of R sub k (psi,z) which is closely connected to the local truncation error. For Vol.1, see N75-12677. Author

N75-22024# Lockheed Missiles and Space Co., Palo Alto, Calif.
KALMAN FILTER WITH BIAS
N. N. Korobov and A. A. Dolgii [1975] 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), no. 1, 1975 p 45-50

Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The use of the Andreev probabilistic quality functional is considered for the extension of the Kalman result to the case of a biased estimate. The solution of the optimal linear filtration problem which results in the Kalman filter was used to produce a Markov signal model. Other topics discussed include quality criteria, Hamiltonian functions, optimal gain matrices, and differential equations. M.J.S.

N75-22025*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN INITIAL FEASIBILITY STAGE FOR STOER'S CONSTRAINED LEAST SQUARES ALGORITHM
Charles L. Lawson 15 Apr. 1975 19 p refs
(Contract NAS7-100)
(NASA-CR-142189; JPL-TM-33-724) Avail: NTIS HC $3.25 CSCL 12A

A procedure is described for computing an initial feasible vector, x sub 0, for Stoer's algorithm for solving the linear least squares problem subject to linear equality and inequality constraints. The procedure described fits well with Stoer's algorithm since much of the computation performed to determine x sub 0 accomplishes initializing transformations of the problem data, which would otherwise be done in Stoer's algorithm after being given an x sub 0. Author

N75-22026# Rice Univ., Houston, Tex.
ON THE OPTIMIZATION OF CONSTAINED FUNCTIONS: COMPARISON
A. V. Levy and V. Guerra 1975 46 p refs
(Grant NSF GP-41158)
(AAR-125) Avail: NTIS HC $3.75

The problem of minimizing a function f(x) subject to the nonlinear constraint phi(x) =0 is considered, where f is a scalar, x is an n-vector, and phi is a q-vector, with q less than n. The sequential gradient-restoration algorithm (SGRA) and the gradient-projection algorithm (GPA) are discussed. These algorithms are composed of the alternate succession of gradient phases and restoration phases, but differ in problem formulation, structure of the gradient phase, and structure of the restoration phase. The SGRA and GPA are compared by considering speed of convergence and robustness (the capacity of an algorithm to converge to a solution). Six new experimental algorithms were generated by combining parts of both algorithms, and a comparison shows that the SGRA is on the average faster than the GPA. Examples show that the SGRA's advantage in robustness is more prominent as the curvature of the constraint increases, and it provides a better search direction as well as a superior stepsize control than the GPA restoration. Author

N75-22027# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
NONLINEAR FILTERING THEORY: APPLICATION TO DATA PROCESSING AND IDENTIFICATION IN AUTOMATION Ph.D. Thesis - Toulouse Univ. [LA THEORIE DU FILTRAGE NON LINEAIRE ET SES APPLICATIONS AU TRAITEMENT DU SIGNAL ET A L'IDENTIFICATION EN AUTOMATIQUE]
Gerard Alengrin 1974 176 p refs In FRENCH
(LAAS-Publ-1109) Avail: NTIS HC $7.00

The main theoretical results on nonlinear filtering were reviewed with regard to modelization by stochastic differential equations and considering continuous, continuous-discrete, and discrete filtering. The approximation of nonlinear filters is discussed with regard to the reduction to algorithms of finite dimensions. A class of methods akin to functional approximation is presented, and examples of corresponding nonlinear filters are given. Methods of analysis of suboptimal filter performance are included. Nonlinear filtering applied to estimation and filtering of ill-identified dynamic systems submitted to noise were investigated. The phase demodulation problem for a signal imbedded in noise was formulated with regard to phase-lock loops and the performance of this suboptimal filter. ESRO

N75-22028# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
ESTIMATING AND FILTERING FOR STOCHASTIC MODELIZATION IN AUTOMATION Ph.D. Thesis - Toulouse Univ. [ESTIMATION ET FILTRAGE DANS LA MODELISATION STOCHASTIQUE EN AUTOMATIQUE]
Joseph Aguilar-Martin 1974 147 p refs In FRENCH
(LAAS-Publ-1135) Avail: NTIS HC $5.75

The importance of linear estimation as an approximation obtained from orthogonal stochastic projection is stressed with regard to situations where parameters belong to functional sets. An example is given of instationary modelization using the DOOB concept of Markov process in a broad sense. Using a Root result allows a problem reduction in linear estimation of a wide class of identification problems. The approximate adaptive estimation concept is discussed, and the optimal procedure in the sense of maximal information usage is derived leading to a nonlinear filtering problem for which an algorithm is given. Partial results tend to justify nonlinear filtering by adequate solving techniques with regard to the discretization of the conditional probability function, its representation by a finite number of parameters exactly or by approximation, and approximation in the representation of nonlinear systems. The classical observability concept redefined stochastically was related for nonlinear systems to the entropy evolution in recursive systems. ESRO

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-22029*# Behavioral Technology Consultants, Silver Spring, Md.
STATISTICAL EVALUATION OF TIME SERIES ANALYSIS TECHNIQUES. VOLUME 2: APPENDICES Final Report
Jun. 1973 126 p
(Contract NAS9-12902)
(NASA-CR-134012) Avail: NTIS HC $5.75 CSCL 09B
For abstract, see N73-30995.

N75-22030# Illinois Univ., Urbana. Dept. of Computer Science.
[RESEARCH PROGRESS ON ON-LINE VIDEO PROCESSING STOCHASTIC COMPUTING, ELECTRO-OPTICS, PATTERN RECOGNITION, AND DISPLAY DEVICES] Final Report
W. F. Poppelbaum 1973 28 p refs
(Contract N00014-67-A-0305-0007)
(AD-A002305) Avail: NTIS CSCL 09/2

This report describes the work done under the contract, in the following areas: On-line video processing, stochastic computing, electro-optics, pattern recognition, and display devices. Photographs of the most important projects are included. GRA

N75-22031# Picatinny Arsenal, Dover, N.J.
BAYESIAN ESTIMATION OF RELIABILITY FOR COMPONENTS WITH INDEPENDENT, NORMALLY DISTRIBUTED CHARACTERISTICS
John G. Mardo and Thomas G. McCarthy Dec. 1974 35 p refs
(DA Proj. 1T0-61102-B-14A)
(AD-A003248; PA-TR-4670) Avail: NTIS CSCL 14/4

This report presents an approach to component reliability assessment for the case where component reliability is defined as the probability that an appropriate set of observable characteristics will fall within specified limits and where the component characteristics are assumed to be independently and normally distributed. A Bayesian statistical approach is employed, the results of which can be directly applied in a system reliability assessment approach previously documented. The formulation, computational algorithm, and examples of applications are provided. The approach is then generalized and, as an example, applied to the Poisson process yielding time-to-failure data from an exponential distribution. GRA

N75-22032# Brown Univ., Providence, R.I. Div. of Applied Mathematics and Engineering.
A SURVEY OF SOME APPLICATIONS OF PROBABILITY AND STOCHASTIC CONTROL THEORY TO FINITE DIFFERENCE METHODS FOR DEGENERATE ELLIPTIC AND

PARABOLIC EQUATIONS
Harold J. Kushner Nov. 1974 76 p refs
(Contract N00014-67-A-0101-001804; Grant NSF GK-40493; NR Proj. 041-411)
(AD-A002983) Avail: NTIS CSCL 12/1

Finite difference methods for degenerate linear and (certain) non-linear elliptic and parabolic equations are analyzed from a probabilistic point of view, and probabilistic methods to show convergence to the correct weak or strong sense solution. The techniques generalize results in numerical analysis, and the probabilistic approach allows some additional physical insight to be brought to bear on the problem of selecting suitable approximations and methods of solution. The equations which are discussed all have probabilistic interpretations. GRA

N75-21958* Kanner (Leo) Associates, Redwood City, Calif.
SOME STATISTICAL ANALYSIS TECHNIQUES FOR THE EFFECT OF SYSTEMATIC INSTRUMENT ERRORS ON THE RESULTS OF MEASUREMENTS IN A SPACE EXPERIMENT
S. P. Kondakov *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 34-42 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 58-71 (For availability see N75-21952 13-59)
CSCL 12A

N75-21959* Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF DISCONTINUITIES IN THE DERIVATIVE OF A PIECEWISE-SMOOTH FUNCTION ON THE BASIS OF THE RESULTS OF MEASUREMENTS
L. S. Gurin and N. P. Ivanova *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 43-48 ref Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 72-79 (For availability see N75-21952 13-59)
CSCL 12A

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-22033 Tennessee Univ., Knoxville.
DIGITAL COMPUTER SIUMULATION OF HIGH TEMPERATURE THERMOCOUPLES SUBJECT TO INSULATOR SHUNTING ERRORS Ph.D. Thesis
Jon Robert McDearman 1974 164 p
Avail: Univ. Microfilms Order No. 75-3622

The use of a network model to predict the error in the measured output of a thermocouple which occurs due to the decrease in the resistivity of the electrical insulation in the thermocouple at high temperatures was investigated. Network models, and digital computer programs which numerically implement the models, which can be used to calculate either the steady state response or the electrical transient response of a high temperature thermocouple were developed. These models and associated programs can be used to predict errors, to examine the effects of changes in either the thermocouple configuration or thermocouple material properties, and to examine new methods for interrogation or surveillance of high temperature thermocouples. A method is presented which will approximate the true steady state hot junction temperatre of a high temperature thermocouple from a series of temperature measurements.
Dissert. Abstr.

N75-22034 New Mexico Univ., Albuquerque.
PARAMETER SENSITIVITY AND SYNTHESIS OF PASSIVE UNIFORM DISTRIBUTED NETWORKS Ph.D. Thesis
James Kenneth Linn 1974 195 p Sponsored by ERDA
Avail: Univ. Microfilms Order No. 75-6970

Parameter sensitivity-considerations in synthesis methods and sensitivity minimization techniques are considered for the class of passive uniform RC distributed networks. Two methods, one graphical and the other analytical, were established for approximating distributed parameter network responses in the frequency domain. A new sensitivity invariant was established for uniform distributed parameter driving-point functions. Sensitivity distributions resulting from canonic network synthesis methods were examined. A new synthesis method for a class of URC distributed network driving-point functions was developed which reduces parameter sensitivity. The adaptation of lumped-parameter equivalent network generation techniques to URC distributed networks is considered in order to minimize parameter sensitivity. Specific generation techniques include the continuously equivalent network and the state variable equivalent network. Indexes-of-performance for distributed networks based upon network cost are presented. Dissert. Abstr.

N75-22035# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
STABILITY OF MANY-COMPONENT SYSTEMS
S. K. Kuzmin and S. V. Temko 1974 18 p refs In RUSSIAN
(JINR-P4-8104) Avail: ERDA Depository Libraries HC $4.00

Definite grounds are given for the general method of finding the minimizing vector-measure for many-component particle system which obeys the Liapunov criterion on stable equilibrium. Author (NSA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-22036 Polish Academy of Sciences, Warsaw.
STIMULATION OF AN IDEAL CONCENTRIC SYSTEM WITH A MAGNETIC CURRENT LOOP [POBUDZANIE UKLADU KONCENTRYCZNEGO IDEALNEGO PETLA Z PRADEM MAGNETYCZNYM]
Bozena Jakorzynska 27 Sep. 1973 17 p refs In POLISH
(Rept-3/1973) Avail: Issuing Activity

The problem for the case of an ideal state was solved as a first step for solving analogous boundary value problems, including the finite conductivity of the external cylinders. The constant wave propagations types are discussed along with Fourier transformations, wave equations, Bessel functions, and very low frequencies. Transl. into M.J.S.

N75-22037 Florida Univ., Gainesville.
TURBULENT ENERGY DIFFUSION IN A HOMOGENEOUS FIELD Ph.D. Thesis
Ronald S. Brunsvold 1974 46 p
Avail: Univ. Microfilms Order No. 75-3479

One-dimensional turbulent energy waves were produced in the wake of an oscillating grid. The downstream decay of these energy waves was measured and is directly related to the diffusion of turbulent energy. By using the turbulent energy equation, which reduces to the one-dimensional diffusion equation in this case, Eddy diffusion coefficients were calculated. These coefficients are approximately three times as large as previously found coefficients for the diffusion of heat and momentum.
Dissert. Abstr.

N75-22038 Polish Academy of Sciences, Warsaw.
DIRECTIONAL FUNCTIONS OF MAGNETIC SOURCES RADIATING OVER A PLANE WITH GRINBERG-FOK CONDITIONS [O FUNKCJACH KIERUNKOWYCH ZRODEL MAGNETYCZNYCH PROMIENIUJACYCH NAD PLASZCZYZNA Z WARUNKAMI GRINBERGA-FOKA]

Lucjan A. Wegrowicz 1974 23 p refs In POLISH
(Rept-14/1974) Avail: Issuing Activity

The directional functions of magnetic sources were determined in the case where they are parallel to unideally conductive boundary plane with Grinberg-Fok boundary conditions. Other topics discussed include Helmholtz equations, Green function, Hankel functions, and electromagnetic fields. Transl. by M.J.S.

N75-22039 Virginia Polytechnic Inst. and State Univ., Blacksburg.
DYNAMIC CHARACTERISTICS OF A SPINNING BODY WITH FLEXIBLE PARTS Ph.D. Thesis
Jer-Nan Juang 1974 114 p
Avail: Univ. Microfilms Order No. 75-3465

The dynamic characteristics are discussed of a spinning body consisting of n + 1 parts, of which one part is rigid and n parts are elastic. The equilibrium configuration was determined by solving a set of nonlinear differential equations in space. The motion characteristics of the system in the neighborhood of the nontrivial solutions were developed by a discretization procedure based on the Rayleigh-Ritz approach. The natural frequencies of the complete structure were obtained by a special algorithm based on the methods of Householder and Jacobi. As a by-product, a special procedure avoiding complex arithmetic computation was developed for the skew symmetric eigenvalue problem. The method was applied to the RAE/B satellite. The results are in line with those obtained by other investigators studying the same satellite by an entirely different approach. Dissert. Abstr.

N75-22040 California Univ., San Diego.
THERMOELASTIC STRESS WAVES GENERATED BY ELECTROMAGNETIC RADIATION IN NEARLY TRANSPARENT SOLIDS Ph.D. Thesis
Chih-Horng Ho 1974 144 p
Avail: Univ. Microfilms Order No. 75-4639

For sufficiently low energy levels, thermoelastic stress waves develop following the instantaneous absorption and conversion to Joule heat of impulsive, electromagnetic radiation in the interior of nearly-transparent solids. A theoretical analysis is presented of several problems of this type for two models of solid media. Equations are formulated for linearized hydrodynamic theory and linearized thermoelastic theory. The hydrodynamic model (the quiescent inviscid fluid) is simpler and more tractable mathematically. It is also the limit case of zero shear modulus in the thermoelastic model, and so the thermoelastic analysis is more general and includes the results of the hydrodynamic model. Two problems of uniform irradiation of long cylindrical rods are considered. The principal conclusions reached are: (1) the fractures experimentally observed in quartz along planes inclined to the beam axis are caused by thermoelastic shear stresses arising from unequal principal compressive stresses in the radial and axial direction; (2) the maximum shear stress is affected by thermal diffusion only if the thermal diffusivity is very large or if the beam waist radium at the focal point is of the order of the optical wavelength; and (3) it is the power intensity rather than the total delivered energy of the pulse that is significant in providing high thermoelastic stresses. Dissert. Abstr.

N75-22041 Mississippi State Univ., State College.
SOME FIELD COMPUTATIONS BY THE METHOD OF MOMENTS AND THE SINGULARITY EXPANSION METHOD: THE CROSSED WIRE SCATTERER AND AN APERTURE IN A CONDUCTING SHEET Ph.D. Thesis
Billy Dale Graves 1974 168 p
Avail: Univ. Microfilms Order No. 75-4200

The solution of the aperture problem is formulated in terms of coupled integral equations which should be independent of the frequency range. A set of coupled integral differential equations for the induced current on a set of crossed wires is derived in the Pocklington formulation using thin wire theory. This set of equations was solved by use of the method of moments employing point matching and a piecewise sinusoidal current representation. The results are compared to those given by the Hallen theory. The time domain response of the induced current was found by using the singularity expansion technique. Natural frequencies, natural mode vectors, and time history plots are given where the time history is compared to that given by the Fourier inversion techniques using Hallen theory. Electromagnetic scattering by a disk zero thickness was investigated by using the method of moments, and the results are compared with some experimental data and calculations made using the low frequency approximation for the current density of a disk. The diffracted electric and magnetic fields of a circular aperture were calculated by using Babinet's principle, and the results were compared with experimental, low frequency, and Kirchhoff theory results for the near and far fields. Dissert. Abstr.

N75-22042 Texas A&M Univ., College Station.
THE THERMAL FORCE AND THE THERMOMAGNETIC FORCE IN RAREFIELD GASES Ph.D. Thesis
Lorne Arthur Davis, Jr. 1974 111 p
Avail: Univ. Microfilms Order No. 75-2841

The thermal force on a sphere and on disks suspended between parallel plates was measured in the gases He, Ne, Ar, N2, and HD over a broad range of mean free paths. All disks were oriented with their surface perpendicular to the heat flux. The behavior of the thermal force near the observed maximum is explained in terms of the momentum transfer theories of Waldmann and Vestner, which characterize the thermal force as being proportional to the translational heat flux and the square of the radius. Measurements of the thermomagnetic force near the observed maximum on a disk in N2 and HD are in agreement with a theory by Vestner for the magnitude and the field dependence of the magnetic field induced change in the thermal force and in the associated translational heat flux. The first observation of the thermomagnetic force on a sphere is reported. Comparison is made with other existing theories for the thermal force at lower and higher pressures than the Waldmann limit. Dissert. Abstr.

N75-22043 Wisconsin Univ., Madison.
TIME-DEPENDENT PERIODIC PERTURBATION OF A TWO-LEVEL QUANTUM SYSTEM Ph.D. Thesis
David Roger Dion 1974 347 p
Avail: Univ. Microfilms Order No. 74-22114

A two- (nondegenerate) level quantum system interacting with a classical monochromatic radiation field is described. The existing work on this problem is reviewed, and some aspects of the problem are presented. Dissert. Abstr.

N75-22044 Pittsburgh Univ., Pa.
THEORETICAL STUDIES OF MAGNETOELASTIC MODES IN FERROMAGNETS AND OF SOME PHASE TRANSITIONS IN ANTIFERROMAGNETS Ph.D. Thesis
Hueiming Chow 1974 75 p
Avail: Univ. Microfilms Order No. 75-6352

The magnetoelastic-mode theory of easy-plane hexagonal ferromagnets was approached from the general principle of small oscillations around the equilibrium configuration. A general formula for normal-mode energies was obtained by diagonalizing the Hamiltonian, properly retaining terms quadratic in magnon-magnon, phonon-phonon, and magnon-phonon operators. It is found that magnons and phonons are strongly mixed in the region of small k for transverse waves propagating in certain directions parallel to the hexagonal plane when an external field is applied along the hexagonal hard direction and is close to 36K sub h/M (hexagonal anisotropic field). The spin waves propagating along the c axis are well approximated by the Turov-Shavrov frozen-lattice model because the extremely strong axial anisotropy makes the dynamical interaction (quadratic magnon-phonon terms) diminished. The mechanism of the field induced first-order phase transitions and the Morin transition in hematite at low temperatures were studied. Dissert. Abstr.

N75-22045# Advisory Group for Aerospace Research and Development, Paris (France).
ELECTROMAGNETIC WAVE PROPAGATION INVOLVING IRREGULAR SURFACES AND INHOMOGENEOUS MEDIA
A. N. Ince, ed. (Shape Air Defense Tech. Center) Feb. 1975 501 p refs In FRENCH and ENGLISH Presented at the Electromagnetic Wave Propagation Panel Symp., The Hague, 25-29 Mar. 1974
(AGARD-CP-144) Avail: NTIS HC $12.25

The proceedings of a conference on electromagnetic wave propagation are presented. The conference was concerned with: (1) propagation of surface waves over irregular and/or inhomogeneous terrain, (2) scattering from rough surfaces and

volumes, and (3) guided wave propagation in the presence of irregularities. The characteristics of communication systems which require a knowledge of electromagnetic wave propagation are discussed. Mathematical theories of radio wave propagation are included. For individual titles, see N75-22046 through N75-22082.

N75-22046 Shape Air Defense Technical Center, The Hague (Netherlands).
TECHNICAL REVIEW OF EM WAVE PROPAGATION INVOLVING IRREGULAR SURFACES AND INHOMOGENEOUS MEDIA
A. N. Ince *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)

A review of lectures on electromagnetic wave propagation is presented. The subjects of the papers are as follows: (1) development of models for electromagnetic propagation over rough surfaces, (2) electromagnetic propagation in layered guiding structures with irregular boundaries involving mode coupling and conversion, (3) remote sensing using an airborne radar scatterometer and a noncoherent pulse radar on a stationary platform, and (4) ground wave propagation over irregular and nonhomogeneous earth including land-sea boundaries, varying soil types, and mountain ridges. Author

N75-22047 Technische Hogeschool, Eindhoven (Netherlands).
MATHEMATICAL THEORIES OF RADIO-WAVE PROPAGATION: AN HISTORICAL SURVEY c32
H. Bremmer *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 14 p refs (For availability see N75-22045 13-70)

Mathematical models are developed to describe the characteristics of radio wave propagation. The purpose of the analysis is to determine the field strength due to a point source (the transmitter) placed in an homogeneous medium (the lower atmosphere), the field being observed on or slightly above an homogeneous sphere (the earth) and the electrical parameters of the two homogeneous media being known. The approaches considered are: (1) the Watson transformation, (2) the impedance boundary condition, (3) the effect of the horizontal atmospheric stratification, and (4) the statistical elements in wave propagation problems. Author

N75-22048 Colorado Univ., Boulder. Dept. of Electrical Engineering.
MODELING OF ROUGH SURFACES
P. Beckmann *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 10 p refs (For availability see N75-22045 13-70)

The theory of scattering electromagnetic waves by rough surfaces is analyzed in terms of the prediction problem and the probing problem. The models of central importance are identified as those generated by random processes. The models can be reduced to two broad groups: (1) models using exact boundary conditions and an approximate evaluation (the Rayleigh method) and (2) models using approximate boundary conditions and accurate evaluation (the Kirchoff method). Both methods are capable of vectorization for treating the polarization of the scattered field in addition to its amplitude and phase. Author

N75-22049 Imperial Coll. of Science and Technology, London (England).
NEW JUSTIFICATION FOR PHYSICAL OPTICS AND THE APERTURE-FIELD METHOD
R. H. T. Bates *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 7 p refs (For availability see N75-22045 13-70)

The extended boundary condition (optical extinction theorem) is used to examine the physical optics (Kirchoff) approximation to exact diffraction theory for scatterers of arbitrary shape having surfaces that can be usefully characterized by surface impedences. For inhomogeneous media with rough surfaces, without any asymptotic constraint on the shapes of the surfaces, the physical optics forms for the surface currents lead to satisfaction of the extended boundary condition deep inside the media, under fairly wide sets of conditions. The form of the incident field affects the goodness of the physical optics approximation. Flat surfaces have a special significance for physical optics. How to make use of ray-optical techniques to compute the equivalent surface currents on fictitious flat surfaces in front of the actual surfaces is discussed. Author

N75-22050 Harry Diamond Labs., Washington, D.C.
A THIRD-ORDER SPECULAR-POINT THEORY FOR RADAR BACKSCATTER c32
James E. Seltzer *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 16 p refs (For availability see N75-22045 13-70)

Two principal modifications to the existing theory for electromagnetic backscattering from randomly rough surfaces with Gaussian height distributions are employed to extend the theory and make it more consistent with the physical optics solutions for reflections from curved surfaces. First, the geometrical optics solution for reflection from a point of stationary phase has been modified to include the contribution from the third-derivative terms in the power series expansion of the argument of the exponential in the Helmholtz integral thereby precluding the prediction of infinite backscattered fields from specular points that are also points of zero Gaussian curvature. Second, the spatial densities of specular points have been determined as a function of the height coordinate with respect to the mean surface. In consonance with the latter development, height-dependent shadowing probabilities and means and mean-square values for the scattering amplitudes have been derived. Author

N75-22051 Texas A&M Univ., College Station.
ON VOLUME-DEPENDENT DEPOLARIZATION OF EM BACKSCATTER FROM ROUGH SURFACES
John W. Rouse, Jr. *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 6 p refs (For availability see N75-22045 13-70)

Recent investigations of the depolarization of backscatter of coherent optical energy incident upon rough surfaces indicate that subsurface volume scatter is a primary depolarization mechanism. Measurements of inhomogeneous dielectric targets indicate that a depolarization ratio of unity is possible, i.e. total depolarization, and that the depolarized component is controlled almost exclusively by the degree of volume scatter within the sample. An extension of the physical optics approach has been formulated to incorporate contributions due to scattering within the subsurface volume. The study indicates that depolarization due to volume scatter is highly dependent upon the properties of the material; that volume scatter could govern the depolarization near vertical incidence; and that multiple surface scatter is most influential at incidence angles greater than 30 deg. The basic experimental work has been performed at optical wavelengths in the laboratory, however, airborne microwave radar and radiometer measurements of sea ice have also been shown to exhibit a strong dependence on a volume scatter mechanism. This phenomena is apparently responsible for the excellent sea ice type differentiation observed in recent sensing studies. Author

N75-22052 Naval Underwater Systems Center, New London, Conn.
SCATTERING FROM A SINUSOIDAL OCEAN SURFACE EXCITED BY A LONG, HORIZONTAL, ELECTRIC LINE SOURCE
Dennis E. Fessenden *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)

The space wave electric field produced by a horizontal electric line source located above a traveling ocean surface is discussed. The ocean surface is approximated by a perfectly conducting, sinusoidal surface. Situations arise where the sinusoidal model is a good approximation of an actual ocean surface. For this case, the amplitude of the sinusoidal surface is small compared with a freespace wavelength; therefore, a Fourier integral-perturbation series approach can be used to solve the boundary value problem. The line source is oriented parallel to the crests and troughs of the sinusoidal ocean waves; thus, the problem is reduced to two dimensions and only one electric field component. The resulting space wave field is composed of the incident and specularly reflected field from a perfectly conducting,

flat surface plus a scattered term for the sinusoidal roughness. The magnitude of the scattered term is directly proportional to the sinusoidal surface amplitude in wavelengths, and Bragg scattering occurs for specific wavenumber relationships. Graphs are presented of the field variation as a function of the sinusoidal wave motion. Although the scatter theory was applied to a sinusoidal surface, it can be shown that the theory can be applied to any surface that is Fourier transformable. Author

N75-22053 Technische Hogeschool, Eindhoven (Netherlands).
PROPAGATION THROUGH INHOMOGENEOUS AND STOCHASTIC MEDIA
H. Bremmer *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 10 p refs (For availability see N75-22045 13-70)

The propagation phenomena connected with the stochastic inhomogeneity of the atmosphere are discussed. The theory relates statistical properties of the inhomogeneity with those expected for the field intensity fluctuations. Two quantities prove to be of dominating importance: (1) the distance (D sub B) along which one single scattering is only to be expected and (2) the scale of turbulence, which is a measure of the inhomogeneity of the medium. The numerical values of these parameters fix the physical characteristics of the propagation in question. They can be represented by a point in a plot giving the penetration depth of the wave in the medium versus the quantity D sub B. The various domains in this plot involve different propagation properties. Results are given which concern the variance and the distribution of the possible values of the irradiance for a wave that has covered a specified distance through the medium. Author

N75-22054 Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
PROPAGATION IN DUCTS AND WAVEGUIDES POSSESSING IRREGULAR FEATURES. FULL WAVE SOLUTIONS
E. Bahar *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surface and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

The impetus to produce rigorous solutions to more realistic models of pertinent propagation problems over a wide frequency range has generated the need to derive full wave solutions to problems of radio wave propagation in nonuniform multilayered structures. The considerable growth in civil and military interest in the development of more reliable communication and detection systems, the potential for developing radio wave methods for remote sensing and the need to develop hardened communication systems have contributed much to this renewed interest. These developments have been paralleled by remarkable advances that have been made in the availability of high powered, very low frequency electromagnetic sources that are capable of radiating deeper into the earth's crust as well as the availability of transmitters operating at optical frequencies. The ready access to large, versatile digital computers has made it possible to employ the full wave approach to obtain numerical solutions to a wide class of important problems which have hitherto been either ignored or over-idealized in order to reduce them to tractable problems. Author

N75-22055 Polytechnic Inst. of New York, Farmingdale.
ASYMPTOTIC TECHNIQUES FOR PROPAGATION AND SCATTERING IN INHOMOGENEOUS WAVEGUIDES AND DUCTS
L. B. Felsen *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 5 p refs (For availability see N75-22045 13-70)

A ray-optical procedure of fairly recent origin provides new physical insight and quantitative accuracy for modal excitation and coupling due to localized sources or scatterers. The theory and several applications are reviewed. Concerning the ray-modal conversion process, attention is given to the lateral ray shift associated with total reflection; this phenomenon has been a subject of interest in the recent literature on optics and integrated optics. The ray method is then extended to the tracking of inhomogeneous waves, thereby generalizing its applicability to evanescent fields, leaky waves and Gaussian beams. This more general theory is illustrated by Guassian beam propagation in a medium with transversely stratified refractive index, and by scattering of a Gaussian beam at a curved boundary. Some observations are made concerning the locality of propagation and scattering processes for homogeneous and inhomogeneous waves. Author

N75-22056 Laboratoire d'Optique Electromagnetique, Marseille (France).
DIFFERENTIAL FORMULAS FOR DIFFRACTION PROBLEMS IN THE RESONANCE DOMAIN [FORMALISME DIFFERENTIEL POUR LES PROBLEMES DE DIFFRACTION DANS LE DOMAINE DE RESONANCE]
R. Petit *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs In FRENCH (For availability see N75-22045 13-70)

Differential procedures used to study diffraction grating problems of periodic surfaces are examined. In particular, partial differential equations, truncated Fourier series, Rayleigh hypothesis, and Helmholtz equations are discussed. Data cover application of conformal mapping to electromagnetic wave scattering by gratings, anomalies of diffraction gratings, scattering by dielectric cylinders with arbitrary cross section shape, and optical grating couplers. Transl. by E.H.W.

N75-22057 GEC-Marconi Electronics Ltd., Chelmsford (England).
SCATTERING OUT OF THE EVAPORATION DUCT
S. Rotheram *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

The theory of beyond the horizon radiowave propagation in the evaporation duct with a smooth sea surface and a smooth refractive index variation is discussed. It has been shown that the theoretical predictions nearly always exceed the experimental values. It is postulated that this is a consequence of scattering out of the duct by the rough sea surface and atmospheric turbulence. A method is given for taking into account the rough sea surface in which the smooth sea reflection coefficient is replaced by a rough sea reflection coefficient of well-known form. This is then converted into a surface impedance boundary condition to be satisfied by the height-gain functions. Some numerical results are presented and a preliminary comparison made with experimental results. Author

N75-22058 Southampton Univ. (England). Dept. of Electronics.
PROPAGATION IN CURVED MULTIMODE CLADDED FIBRES
W. A. Gambling, D. N. Payne, and H. Matsumura *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 16 p (For availability see N75-22045 13-70)

An analysis is given of coupling between modes in curved, cylindrical, multimode optical fibers. The coupling coefficients are derived. The coupling characteristics of the various modes are developed. The degree of mode conversion is stated as largely restricted to a periodic exchange of energy, between the modes, along the length of the fiber with a periodicity which can be less than one millimeter. This form of quasi-single-mode operation is reflected in very low values of pulse dispersion, but is very sensitive to stress in the fiber. The significance of these results in terms of mode conversion is discussed. Author

N75-22059 Kansas Univ., Lawrence.
REMOTE SENSING OF SURFACE PROPERTIES c43
Albert Wayne Biggs *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

A review of some experimental techniques used in remote sensing of the earth's surface is presented. The experimental techniques utilize remote sensing systems in airborne and stationary platforms. The remote sensing systems are on airborne radar scatterometer and a noncoherent pulse radar on a television tower at an altitude of 75 meters above the earth's surface. The results are presented in the form of the radar backscatter coefficient as a function of elevation angle. The forms of terrain are ocean surfaces, polar sea ice and vegetation. Author

N75-22060 McDonnell Aircraft Co., St. Louis, Mo.
POLARIZATION DISCRIMINATION IN REMOTE SENSING c32

J. C. Leader *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 12 p refs (For availability see N75-22045 13-70)

Experimental measurements of the scattering cross section of various materials in both the microwave and optical spectrum have shown a complex behavior as a function of the experimental variables of polarization, frequency, and scattering geometry. Although it has long been recognized that the material variables of surface roughness and dielectric constant must in some fashion govern the material's scattering properties, a complete description of observed scattering behavior in terms of only these variables has not, to date, proved possible. There are numerous examples of multi-polarization radar imagery which have defied an adequate interpretation in terms of material surface scattering properties alone, particularly with regard to anomalies in the co-polarized and cross-polarized returns. Although polarization sensitive remote sensing using active sources in the optical spectrum is in its infancy, a similar state of confusion regarding interpretation may be expected unless a better understanding is available regarding fundamental scattering characteristics. Theoretical and experimental works which provide a basis for explaining many observed scattering characteristics are reported. This explanation is made possible by including the effects of volume scattering as a re-radiation source. The experimental data provided result from optical measurements; however, corresponding agreement between theory and experiment has also been shown in the microwave spectrum. Author

N75-22061 Naval Research Lab., Washington, D.C.
THE SECOND ORDER DOPPLER SPECTRUM OF RADAR SEA ECHO FOR FREQUENCIES ABOVE VHF c32

G. R. Valenzuela *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)

The effect of surface tension in the second order Doppler spectrum of radar sea echo is investigated. The analysis includes the angle of incidence dependence, the polarization dependence, and the lossy-dielectric properties of the sea. Surface tension is introduced in the hydrodynamic part of the transfer coefficient. The introduction of surface tension in the analysis allows for resonant interactions of the gravity-capillary wave components on the water surface. Numerical results are presented from the generalized theory for vertical and horizontal polarization as a function of radar wavelength, wind speed, and radar viewing angle in relation to the wind direction. Author

N75-22062 Kansas Univ., Lawrence.
VOLUME SCATTERING FROM ICE AND WATER IN INHOMOGENEOUS TERRAIN

Albert W. Biggs *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 13 p refs (For availability see N75-22045 13-70)

Volume scattering of electromagnetic waves from Arctic sea ice and terrain with varying amounts of water is considered. Physical properties of sea ice and dielectric properties of snow are described in terms of mixtures of ice and water and the Debye relaxation spectra of water at microwave frequencies. Scattering models include brine pockets in sea ice, ice spheroids in glacial snow, and varying amounts of water in snow and ice. Radar backscatter measurements of sea ice and SLAR images are interpreted with these models. Three models of volume scattering are described. The first model is developed from Lambert's Law, which indicates that light scattered from a radiating surface varies in intensity as the cosine of the propagation direction and the surface normal. The second is made by replacing the terrain by a single layer of spheres, which scatter equally in all directions. The third model considers many layers of spheres. The spheres of ice are treated as Eaton lenses, which yield a much higher scattering cross section than that of a perfectly conducting metal sphere of the same size. Author

N75-22063 Western Ontario Univ., London. Centre for Radio Science.
THE PROPAGATION OF RADIO WAVES THROUGH PERIODICALLY VARYING MEDIA

G. F. Lyon and A. R. Webster *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 6 p refs (For availability see N75-22045 13-70)

The propagation of radio waves through periodically varying media is discussed by treating ionospheric irregularities as perturbations in a smooth ionosphere with a normal electron density versus height profile. It is possible in this way to model any shape or size of irregularity and to predict from the model any change in the number of electrons along any ray path and any angular deviations due to the perturbation. The method is illustrated by modelling periodic irregularities associated with Travelling Ionospheric Disturbances and the findings are compared with some experimental observations. Author

N75-22064 Illinois Univ., Urbana. Electromagnetics Lab.
REMOTE PROBING TECHNIQUES FOR INHOMOGENEOUS MEDIA c35

R. Mittra and D. H. Schaubert *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs (For availability see N75-22045 13-70)
(Grant DA-ARO(D)-31-124-71-G77)

A technique is presented for remote probing a stratified medium using a spectral domain approach which differs from the conventional time-domain technique. The magnitude and phase of the field at the surfaces of the inhomogeneous medium when the probing wave is from the free space region of x less than zero is determined. The value of the measured surface makes it possible to compute the spectral domain counterparts which must be processed to determine the value of x. The computer storage and processing time for this procedure are within the capability of minicomputers. Several numerical results for profile functions are included to illustrate the utility of the method. Author

N75-22065 Rome Univ. (Italy). Ist. di Elettronica.
STRUCTURE OF TROPOSPHERIC INHOMOGENEITIES AS DEDUCED FROM INTERFEROMETRIC MEASUREMENTS c32

Giovanni Dauria and Domenico Solimini *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 13 p refs (For availability see N75-22045 13-70)

A method for identifying the geometry of atmospheric irregularities is illustrated and its use in an experiment is described. The method consists in determining the spatial statistics of the field in a transverse plane at the receiving end of a line-of-sight propagation path. The spatial statistics are derived by measuring the degree of coherence for points aligned in vertical and horizontal directions. By the anisotropy of the coherence, the geometrical structure of irregularities of the part of atmosphere which has been passed through is inferred. By taking advantage of the observation of other quantities that the interferometric technique can provide, the diverse mechanisms of propagation are recognized, thus confirming the existence of a given structure of irregularities. The experiment has been conducted at X-band over a 37.5 Km path, and data which have been obtained from it furnish, among other things, information on the probability of occurrence of meteorological conditions related to the observed structures of irregularities. Author

N75-22066 Manitoba Univ., Winnipeg. Dept. of Electrical Engineering.
RADIOMETRIC SIGNATURES OF COMPLEX BODIES c35

M. A. K. Hamid *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 27 p refs (For availability see N75-22045 13-70)

The basic theory for microwave radiometric signatures of finite stationary or moving, metallic or non-metallic, bodies of simple shape which are either larger in extent than the beam coverage of the radiometer antenna or lie entirely within the beam is outlined. The theory is developed to illustrate modeling concepts by deriving a correction factor due to the finite dimensions or structural inhomogeneities of the body and is extended to few composite bodies which can be viewed as combinations of simple ones. Experimental results for the emission pattern of selected objects are also presented to show the

interaction between the physical parameters of the target and the electrical parameters of the radiometer. Author

N75-22067 Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.

REVIEW OF GROUND WAVE PROPAGATION OVER NON-UNIFORM SURFACE

James R. Wait *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 20 p refs (For availability see N75-22045 13-70)

A consolidated review of recent analytical studies of electromagnetic waves propagating over inhomogeneous surfaces is presented. Emphasis is on smooth boundaries that can be characterized by a local surface impedance. A general integral equation formulation is developed for this situation. A number of special cases are then considered and various methods of solution are described. Various concrete, practical examples are presented, particularly with regard to effects that occur at coastlines. Extensions to certain types of terrain features are also treated using the closely related mode matching method. Some controversial aspects of very recent work on the subject are described. Author

N75-22068 Army Cold Regions Research and Engineering Lab., Hanover, N.H.

SURFACE IMPEDANCE OF RADIO GROUNDWAVES OVER STRATIFIED EARTH

P. Hoekstra, A. Delaney, and P. Sellmann *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 8 p refs (For availability see N75-22045 13-70)

Ground and airborne techniques to obtain subsurface information, for geotechnical objectives, by measuring the surface impedance of radiowaves have been developed. The frequency range covered in these measurements is from 14.7 Khz (VLF) to 660 Khz (BCB). Measurements in the North America Arctic have shown that it is common to encounter changes in the effective resistivity with frequency from several thousand ohm-m at VLF to a few tenths of ohm-m at BCB. These changes are caused by a conductive organic layer over highly resistive frozen ground. Also large regional and local changes in surface impedance were observed. In the permafrost regions changes from 6000 ohm-m to 50 ohm-m at VLF were found to occur frequently over distances of about 100 m. Surveys at VLF on the ground resolve discontinuities in ground conditions over distances of a few meters. Author

N75-22069 Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.

PROPAGATION OVER PASSIVE AND ACTIVE NONUNIFORM SURFACE IMPEDANCE PLANES

R. J. King and S. H. Cho (Wisconsin Univ.) *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 16 p refs (For availability see N75-22045 13-70)

(Grant NSF GK-21218)

Electromagnetic wave propagation over and radiation from nonuniform surface impedance planes are studied by numerical methods using the integral formulation of the compensation theorem. The source is a horizontal magnetic line current and the surface impedance is assumed to only vary in the direction of propagation and have a magnitude less than the intrinsic impedance of free space. Otherwise it is unrestricted. It is shown how the Sommerfeld attenuation function for propagation over a uniform surface can be used to piecewise explain and predict the general behavior of a wave propagating over a nonuniform surface. It is used to determine impedances which support fast or slow, and growing or decaying traveling waves. This gives general guidelines for manipulating the complex surface impedance to achieve specified radiation characteristics, or alternatively, field distributions on the surface. The integral formulation is then used to study microwave surface wave antennas. By varying the profile of the surface reactance magnitude and the antenna length, the radiation characteristics such as directivity, beam width and side lobe level can be optimized. Author

N75-22070 Institute for Telecommunication Sciences, Boulder, Colo.

ANALYSIS OF GROUND WAVE PROPAGATION OVER IRREGULAR, INHOMOGENEOUS TERRAIN

R. H. Ott *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 6 p refs (For availability see N75-22045 13-70)

A numerically feasible way to calculate the field strength of a radio wave propagating over realistic, smoothly varying, inhomogeneous terrain has been developed. The terrain may be represented by a completely arbitrary profile in terms of the elevation versus distance, and the conductivity and dielectric constant may change continuously along the path. One of the features of the surface wave that has been predicted by the numerical solution is a strong focusing phenomenon on lit portions of concave hills. This focusing phenomenon can also be explained in terms of Fock currents for concave surfaces. An example is given where the Fock currents on an equivalent parabola are used to predict the focusing on the lit side of a Gaussian hill. The numerical solution is then applied to a practical engineering problem; showing the effect of terrain features on the efficiency of HF antennas for launching and receiving surface waves over the sea. It is shown that, in general, placing the antenna at the top of the hill may be less efficient than placing it at the coastline, but placing it halfway up the hill may be more efficient than at either the hilltop or the coastline. Author

N75-22071 Shape Air Defense Technical Center, The Hague (Netherlands). Communications Div.

GROUND-LOSS PROFILE ALONG A MULTI-SECTION PATH OF A SKY WAVE

J. C. Arnbak *In* AGARD Electromagnetic Wave Progragation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 10 p refs (For availability see N75-22045 13-70)

For medium- and high-frequency waves radiated by ground-based antennas at low grazing angles, the far field is highly dependent on properties of the ground along the path of propagation. Notably, the conductivity and ground irregularity inside the first Fresnel zone, which typically extends to about one hundred wavelengths in the direction of propagation, affect the strength of the field transmitted to (or received from) distant points. An engineering method to evaluate the associated path loss of a vertically polarized sky wave in the presence of a plane, sectionally homogeneous ground is discussed. The influence of randomly rough surfaces is considered. The section model allows a profitable combination of standard ground data with a fast, numerical extension of simple mixed-path theory. Author

N75-22072 Institut fuer Physikalische Weltraumforshung, Freiburg (West Germany).

ANTENNA IMPEDANCE OF A GROUND-BASED EMITTER IN THE VERY LOW FREQUENCY DOMAIN c32

R. Grabowski *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

The artificial emission of signals with frequencies below 10 kHz and the application of the signals to geophysical research are discussed. The design of an antenna for the emission below 10 kHz with sufficient radiation power is investigated. The antenna impedance with respect to the interaction with the ground is analyzed. Mathematical models are developed to describe the characteristics of an optimum antenna for the low frequency emission characteristics. Author

N75-22073 Admiralty Surface Weapons Establishment, Portsmouth (England).

ANTENNA AND CONDUCTING SCREEN ON A LOSSY GROUND c32

J. F. Goodey *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

The problem of a vertical monopole situated over a small, circular, highly conducting screen lying on a poorly conducting ground has been considered. The electromagnetic field of the system is obtained via a Green's function expansion in oblate spheroidal wave functions. By integrating the outward power flow over the surface of the antenna and the spherical surface at infinity the radiation and loss resistances of the antenna are obtained. Antenna resistances were obtained experimentally in the H.F. band. Radiation patterns were measured at 3 GHz (using

a carbon loaded dielectric material to simulate the behavior of soil at 30 MHz) and their areas used to calculate antenna radiation resistances. The results obtained are applied to the case of an electrically small untuned receiving monopole feeding directly into a transistor amplifier to examine the signal to noise ratio of such a system. It is concluded that although the use of an imperfect ground system can result in a marked reduction in radiation resistance for small screen sizes the effect of the corresponding loss resistance upon the signal to noise ratio is not expected to be significant in the H.F. band. Author

N75-22074 Institute for Telecommunication Sciences, Boulder, Colo.

PROPAGATION OF A LORAN PULSE OVER IRREGULAR, INHOMOGENEOUS GROUND

J. Ralph Johler and Samuel Horowitz (AFCRL, Bedford, Mass.) *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 13 p refs (For availability see N75-22045 13-70)

A numerical solution of an integral equation representation of the ground wave over irregular, inhomogeneous earth has been employed to calculate amplitude and phase of the propagated continuous wave as a function of frequency. A computer simulation again using numerical methods, transforms this result to the time domain yielding the impulse response. Then the impulse response is convolved with the Loran-C pulse function, that has been transformed from the time domain to the frequency domain. The propagation of both pulse envelope and the cycles under the envelope in the presence of irregular, inhomogeneous ground is demonstrated. Although the Loran-C pulse propagation has been studied in detail, the method is applicable to the propagation of most any shape pulse over irregular, inhomogeneous ground. In the particular case of the Loran-C pulse, the discrepancy or time difference between the pulse envelope and cycle is a unique function of the particular type of terrain over which the wave propagates, and it is, at the present state of the art, necessary to introduce such terrain into the propagation theory to give a unique prediction of the pulse propagation time. Author

N75-22075 Army Electronics Command, Fort Monmouth, N.J. Communications/Automatic Data Processing Lab.

THE BEHAVIOUR OF LORAN-C GROUND WAVES IN MOUNTAINOUS TERRAIN

Douglas C. Pearce and John W. Walker *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 9 p refs (For availability see N75-22045 13-70)

The behavior of both the horizontal H-component and the vertical E-component of a Loran-C ground wave has been measured in the vicinity of an isolated terrain anomaly, Nittany Mountain, near State College, Pennsylvania. Time difference measurements were made with Army manpack receivers at 42 sites of good geodetic control in the area. The magnetic component of the ground wave was sensed with a ferrite array antenna while the vertical component was sensed with a whip antenna. Significant local warpages of the loran grid, apparently associated with the presence of the mountain, were observed with each antenna configuration. However, the warpage patterns were not identical for each field component, implying a somewhat different perturbation of each polarization component by the terrain anomaly. These results suggest that a field calibration of a loran grid in a region of a terrain anomaly will depend somewhat on the antenna type used. Author

N75-22076 Institute for Telecommunication Sciences, Boulder, Colo.

SPATIAL AND TEMPORAL ELECTRICAL PROPERTIES DERIVED FROM LF PULSE GROUND WAVE PROPAGATION MEASUREMENTS

Robert H. Doherty *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

Low frequency ground wave phase measurements made on two loran (100 kHz pulse transmissions) paths have been analyzed for spatial variations. One Loran-D path in Nevada and California passes over Death Valley producing a so called Death Valley Anomaly. The other 1000 km Loran-C baseline path between Carolina Beach, N. C. and Dana, Indiana was measured in detail during the spring of 1970. Four locations in addition to the transmitter locations were monitored, one near Carolina Beach (the master), one just east of the Appalachian Mountains, one just west of the Appalachian Mountains and one near Dana, Indiana (the Z slave station). Effective surface impedance values were deduced for each segment of the propagation path. In addition to these spatial evaluations of the phase, temporal variations of the phase over the eastern path were approximately one microsecond, even though synchronization accuracies were better than .1 microseconds. Changes in the surface impedance values as a function time are clearly indicated. Author

N75-22077 Imperial Coll. of Science and Technology, London (England).

SERVICE AREA PREDICTION IN THE VHF AND UHF BANDS c32

H. Page *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 8 p refs (For availability see N75-22045 13-70)

An analysis of the factors which affect the prediction of terrestrial transmitter performance in very high frequency and ultrahigh frequency bands is presented. The main features that determine field strength at a particular point are as follows: (1) terrain irregularities, (2) terrain features such as buildings and trees, (3) scattering of signals by local obstacles when the antenna is low, (4) temporal variations, and (5) multipath propagation. Methods for using these factors in conducting an analysis of electromagnetic propagation and scattering are proposed. Author

N75-22078 Research Inst. of National Defence, Stockholm (Sweden).

PREDICTION AND CALCULATION OF TRANSMISSION LOSS IN DIFFERENT TYPES OF TERRAIN c32

A. Blomquist and L. Ladell *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 17 p refs (For availability see N75-22045 13-70)

A model for the calculation of transmission loss in the VHF and UHF regions has been developed. It has been used in service area predictions in different types of irregular terrain in Sweden with much better results than the existing models. The method is very easy to handle and needs no complicated computer technique. It takes proper account of the ground dielectric constant and the terrain profile including vegetation. It is thus a deterministic model giving the long-term median of the basic transmission loss. In planning terrestrial radio systems it is also necessary to have a knowledge of the variability in time and with location. On that account measurements are presented giving the additional loss for various percentages of time and locations. The best possible use of the capacity of telecommunication systems is often limited by the depolarization produced by absorption and scattering in the terrain. The effect of depolarization is given for various percentages of locations. Author

N75-22079 Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.

MIXED-PATH CONSIDERATIONS FOR RADIO-WAVE PROPAGATION IN FOREST ENVIRONMENTS c32

T. Tamir *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 11 p refs Sponsored in part by ECOM and Army Land Warfare Lab. (For availability see N75-22045 13-70)

The propagation of radio waves is examined for communication paths that may lie partly within a forest and partly in the air region outside the vegetation. For this purpose, the geometry of a mixed path involving a forest layer adjacent to a bare-ground area is shown to exhibit four characteristic regimes. If, for example, the transmitting antenna is inside the forest, these regimes correspond to the receiving antenna being located in one of the following regions: (1) inside the forest; (2) above the tree tops; (3) at a relatively high altitude above the bare-ground region; or (4) at a relatively low height above the bare-ground region. Depending on frequency, on distances, and on which one of the four regimes is involved, the predominant field along the mixed path may be a refracted wave or a lateral wave. By finding the conditions that determine which one of these waves is pre-

dominant, it is possible to establish path losses in practically any regions involving reasonably flat ground contours. The frequency range of application for these considerations extends well into the VHF region. Author

N75-22080 Shape Air Defense Technical Center, The Hague (Netherlands).

INFLUENCE OF TOPOGRAPHY AND ATMOSPHERIC REFRACTION IN UHF GROUND-AIR COMMUNICATIONS c32

A. N. Ince and H. P. Williams *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 26 p refs (For availability see N75-22045 13-70)

The results of field strength measurements in UHF ground-air communication using four different ground terminals are presented. The local conditions at the ground terminals varied considerably: in one case the site was flat and clear over a distance of 2 km, in another the site was the highest in the district, a third site had nearby buildings, while the fourth site had marked local undulations and a nearby valley. In all four cases the field strength at the optical horizon was very close to the theoretical value for a smooth earth. The field strength at this point was virtually unaffected by the local ground conditions. Using this fact, and taking into account the statistics of atmospheric refraction it is possible to predict the reliability of UHF ground-to-air communication for high-flying aircraft. Author

N75-22081 Air Force Avionics Lab., Wright-Patterson AFB, Ohio.

FLIGHT TEST RESULTS OF PROPAGATION EXPERIMENTS THROUGH INHOMOGENEOUS MEDIA

Allen L. Johnson *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 7 p (For availability see N75-22045 13-70)

Flight test evaluation of communication systems to determine the effect of the inhomogeneous propagation media on communication reliability is discussed. The approach taken has been to postulate a physical or mathematical model and then to collect data to determine the validity of the hypothesis. Two related areas which have been studied are ducting and radio holes. Both are caused by an inversion layer. Ray tracing studies were done to establish expected performance under various atmospheric conditions. Data was then gathered on an air-to-air microwave system to validate the model. The test results showed good correlation between predicted and actual results when sufficiently detailed refractive index information was available for the predictions. Two other phenomena investigated were ionospheric scintillation and multipath fading. In the case of ionospheric scintillation the model is not well defined, and the test results were used to refine the model. The test results from the multipath fading flight testing showed that for over-water communications a specular reflection model best defines the actual results while over-land the diffuse fading component is predominant. Author

N75-22082 European Space Research Organization, Noordwikj (Netherlands).

MULTIPATH IN AN AERONAUTICAL SATELLITE SYSTEM c32

H. J. Wuennenberg *In* AGARD Electromagnetic Wave Propagation Involving Irregular Surfaces and Inhomogeneous Media Feb. 1975 18 p refs (For availability see N75-22045 13-70)

The multipath problem as encountered in a civil aeronautical satellite system is analyzed. A model for the multipath reflection is developed and the performance of the communications channels through the satellite is evaluated. The aeronautical satellite system will be used to control air traffic over the Atlantic and Pacific oceans. Aircraft will fly at a height of 10 to 20 km. Severe impairment of the communications performance is expected due to reflection of radiowaves from the surface of the sea and inadequate protection by the aircraft antenna against multipath. A simple theoretical model for reflections from the sea is developed. Under the assumption that only very simple coding schemes can be used to improve the bit error rate for digital transmissions the application of frequency diversity, space diversity and time diversity is discussed. It is shown that frequency diversity is more suitable for the link from the satellite to the aircraft while space diversity can be used for the link from the aircraft to the satellite. The application of time diversity does not reduce the bit error rate by a great amount because of correlation between consecutive bits. It is shown that large delays between messages are necessary to make time diversity attractive. Time diversity would therefore lead to coding by blocks and to storage requirements. Author

N75-22083# Utah Univ., Salt Lake City.

SPECTRAL WEIGHT OF LOW-LYING EXCITATIONS IN THE ONE-DIMENSIONAL SPIN 1/2 HEISENBERG ANTIFERROMAGNET

J. C. Bonner, B. Sutherland, and P. M. Richards 1974 7 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Mater., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(SAND-74-5603; Conf-741202-2) Avail: NTIS HC $3.25

Numerical calculations on a spin 1/2 one-dimensional (1D) Heisenberg antiferromagnet for N = 8 spins, both for the states and their spectral weights, were examined. The work is of interest because of the recent neutron scattering experiments in CuCl2. 2NC5D5 that show the spectral weight to be concentrated at the des Cloizeaux and Pearson (dCP) spin wave frequencies. The states form a two parameter continuum between the dCP value and the upper limit. There is no numerical evidence for the existence of singlet bound states as predicted by Ovchinnikov. Author (NSA)

N75-22084# Sandia Labs., Albuquerque, N.Mex.

MEASUREMENT OF INTERCHAIN DIFFUSION IN A QUASI-ONE DIMENSIONAL HEISENBERG MAGNET

P. M. Richards and R. C. Hughes 1974 14 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Mater., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(SAND-74-5575; Conf-741202-8) Avail: NTIS HC $3.25

The characteristic time for spin polarization to transfer between magnetically inequivalent chains was measured in the quasi one-dimensional salt dichlorobis(pyridine)copper(II) (CuCl2.2NC5H5). The method utilizes the large difference in ESR linewidths between directions of applied field where the chains appear to be inequivalent and symmetry directions where they are equivalent. Data at 23 GHz are presented between 300 K and 4 K and interpreted in terms of temperature variation of the intrachain diffusion coefficient for T approximately greater than 10 K and the effect of antiferromagnetic correlations at lower temperatures. The time does not appear to be influenced by spin lattice relaxation, whereas the linewidth along symmetry directions does appear to be so affected. Author (NSA)

N75-22085# Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods.

DETERMINATION OF THE PARAMETERS OF THE MAGNETIC SYSTEMS FOR PRODUCTION OF HOMOGENEOUS FIELDS USING A COMPUTER

L. Aleksandrov, E. P. Zhidkov, and L. L. Zinoveva 1974 25 p refs In RUSSIAN
(JINR-P11-8059) Avail: ERDA Depository Libraries HC $4.25

The general approach for parameter determination was examined. The mathematical problem was reduced to an over-determined nonlinear system of equations which are solved by means of regularized iteration processes of the Gauss-Newton type. A numerical study of the effect of different factors on the homogeneity of the field was made on the example of a specific magnetic system. Author (NSA)

N75-22086# Sandia Labs., Albuquerque, N.Mex.

HIGH TEMPERATURE SERIES STUDIES OF ISING-LIKE WILSON MODELS IN THREE DIMENSIONS

W. J. Camp and J. P. VanDyke 1974 6 p refs Presented at 20th Ann. Conf. on Magnetism and Magnetic Materials, San Francisco, 3 Dec. 1974
(SAND-74-5313; Conf-741202-8) Avail: NTIS HC $3.25

The susceptibility of continuous-spin Landau-Wilson models on the fcc lattice using exact series expansions through 10th order in the inverse temperature was studied. Both order-disorder (double-well) and displacive (single-well) models were considered. The exponent gamma of the dominant singularity is found to be

1.25 for both types of model. The confluent singularity arising from corrections to scaling is found to have the universal value delta = 0.5. The crossover from Gaussian to Ising behavior is discussed as a function of the quartic coupling constant, and a crossover exponent phi = 1 in all dimensions is found.
Author (NSA)

N75-22087# Oak Ridge National Lab., Tenn.
MAGNETIC FORM FACTOR OF ELECTRONS IN 3D BANDS
R. M. Moon 1974 9 p refs Presented at 20th Ann. Conf. on Magnetism and Magnetic Materials, San Francisco, 3 Dec. 1974 Sponsored by ERDA
(Conf-741202-5) Avail: NTIS HC $3.25

The formalism for calculating the spin density or magnetic form factor for tight-binding band electrons is considered in the case where nearest-neighbor over-lap is not negligible. The formalism leads to a description of the system in terms of a two-component form factor, one of which is identical to the atomic form factor and the other is related to the diffuse overlap density. Numerical calculations for Fe and Ni show that the net overlap density is opposite in direction to the atomic spin. Comparison with experiment is presented for the case of Fe.
Author (NSA)

N75-22088# Sandia Labs., Albuquerque, N.Mex.
COMPARISON OF THE MAGNETIC PROPERTIES OF THE HUBBARD HAMILTONIAN IN THE WEAK CORRELATION LIMIT TO THE HFA
L. C. Bartel and H. S. Jarret 1974 6 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Materials, San Francisco, 3 Dec. 1974 Sponsored by ERDA
(SAND-74-5258; Conf-741202-1) Avail: NTIS HC

Resonance broadening is included along with spin-disorder scattering to study the magnetic properties of the Hubbard-Hamiltonian in the weak correlation limit. The calculated susceptibility is compared to the exchange enhanced Hartree-Fock approximation (HFA) susceptibility, and limits are set on the applicability of the HFA. For a semicircular density of states, HFA appears to be applicable for I/resource smaller than 0.5 and a half-filled band, but for electron (or hole) densities the range of applicability in I/resource descreases.
Author (NSA)

N75-22089# Naval Research Lab., Washington, D.C.
ANALYSIS OF A PROPOSED TWO-FREQUENCY RADAR WAVEFORM Final Report
Merrill I. Skolnik Nov. 1974 64 p refs
(AD-A002942; NRL-MR-2926) Avail: NTIS CSCL 17/9

The report examines a proposed (unsuccessful) method for achieving frequency agility by radiating two frequencies which may take on any value from pulse to pulse, provided the mean frequency remains unchanged. On reception, the signals are combined so as to process the mean-frequency component. The receiver uses an envelope detector as well as a coherent reference at the mean frequency. It is shown that the signal received from a single echo depends only on the mean frequency and not on the difference. This gave encouragement to the idea that MTI processing could be undertaken even though the difference between the two-frequencies was changed pulse-to-pulse. Unfortunately, when clutter was considered, the phase of the processed signal was found to depend on the difference between the two frequencies. This gives rise to an uncancelled residue. Hence, this form of frequency agility is incompatible with MTI. It is possible, however, to use two or more widely spaced frequencies, either simultaneously or in time sequence, in a more conventional MTI system if the same frequencies are repeated.
GRA

N75-22090# Geological Survey, Denver, Colo.
ELECTROMAGNETIC FIELDS ABOUT A FINITE ELECTRIC WIRE SOURCE Final Report
Walter L. Anderson 1974 209 p refs
(PB-238199/4; USGS-GD-74-041) Avail: NTIS HC $7.25 CSCL 20C

A Decsystem-10 FORTRAN IV program is described for numerically computing all Cartesian components of both electric and magnetic fields about a grounded horizontal electric dipole or finite wire source of arbitrary length for the quasi-static case over an isotropic horizontally stratified earth. The calculations for many complex Hankel transforms and complex numerical integrations over a finite interval are discussed. An interactive TTY-printer plot version of the program provides for matching observed and theoretically computed frequency or transient sounding curves. The mutual coupling for a source and receiver configuration is optionally computed. The program listing, documentation, and some example runs are included.
GRA

N75-22091# Radio Corp. of America, Princeton, N.J.
CHARGE-COUPLED SCANNED IR IMAGING SENSORS Semiannual Technical Report, Dec. 1973 - 30 Jun. 1974
Elliott S. Kohn and Melvin L. Schultz 15 Jul. 1974 37 p refs
(Contract F19628-73-C-0282; ARPA Order 2444)
(AD-A003342; PRRL-74-CR-51; AFCRL-TR-74-0375) Avail: NTIS CSCL 17/5

A charge-coupled imager sensitive to infrared light up to 3 micrometers has been fabricated and operated. It consists of a linear array of 64 Pd:p-Si Schottky-barrier detectors adjacent to a three-phase charge-coupled shift register. The design has a single level of metallization with gaps. A single transmission gate, when pulsed on, coupled each detector to its associated shift register gate, thereby setting each barrier to a reverse bias determined by the potential applied to the transmission gate. Incident infrared light discharges the individual detectors during the detector exposure time. The charges transferred into the CCD shift register the next time the transmission gate is pulsed are transferred out sequentially by the charge-coupled shift register to produce the video signal. Visible images were sensed directly by illumination of the shift register through the gaps as well as through the unthinned substrate. Infrared images were sensed by the Schottky-barrier detectors illuminated through the (transparent) substrate.
GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution.*

N75-22092 California Univ., Los Angeles.
NEW ACOUSTO-OPTIC TECHNIQUES FOR MEASUREMENT OF NON-LINEAR INTERACTIONS OF ULTRASOUND Ph.D. Thesis
Norbert Alvord Massie 1974 239 p
Avail: Univ. Microfilms Order No. 75-5691

A technique for measuring the third order elastic (TOE) which promises not only unparalleled accuracy, but freedom from systematic errors is proposed. Optical Bragg scattering of sound by sound is used along with optical heterodyne detection of the scattered radiation, coupled with a signal to noise ratio measurement, to allow a cancellation of not only the acoustic scattering efficiency, but also the heterodyne system gain. The result is a measurement of the acoustic scattering amplitude, from which a calculation of the TOE is made. The technique was applied to second harmonic generation and to noncolinear phonon interactions. In the process of searching for anharmonic mixing of two acoustic beams an optical frequency modulation effect was discovered. This effect was modeled, and confirming experiments performed.
Dissert. Abstr.

N75-22093 North Carolina State Univ., Raleigh.
AERODYNAMIC NOISE IN IDLING WOODWORKING MACHINES Ph.D. Thesis
Thomas Furman Brooks 1974 143 p
Avail: Univ. Microfilms Order No. 75-5346

A combined analytical and experimental study was conducted of the noise due to aerodynamic interaction of rotating cutterheads and stationary table lips in woodworking machines. The dominant mechanisms of sound generation are identified. Mathematical models of these mechanisms were developed in terms of design parameters, and are found to predict accurately the sound field. All cases of machinery are included where stationary surfaces are in the immediate vicinity of rotating cutterheads, e.g., wood planers, jointers, shapers, and molders. The dominant pure tones

were produced aerodynamically by both the source and dipole mechanisms. The contribution to the sound field of each is found to be dependent on the nearness of the rotating and stationary surfaces. General aerodynamic noise theory was used to develop the the mathematical models valid for either straight or helical bladed cutterheads close to table lips of finite length.
Dissert. Abstr.

N75-22094 Cornell Univ., Ithaca, N.Y.
HELICON WAVES AND ELECTROMAGNETIC GENERATION OF ULTRASOUND IN SIMPLE METALS Ph.D. Thesis
Dale Everett Chimenti 1974 123 p
Avail: Univ. Microfilms Order No. 75-6721

Results of two related radio frequency experiments are presented. The magnetic field dependence and magnitude of the high-field Hall coefficient of potassium were determined experimentally by studying the propagation characteristics of high frequency helicon waves. Geometrical measurements were performed in situ using a direct induction ultrasonic technique. The experimental results are discussed in the light of certain recent theories on the magnetoresistance of potassium which predict a decreasing Hall coefficient with increasing magnetic field. The amplitude of electromagnetic generation of ultrasound in monocrystal potassium was measured at 4.2 K as a function of magnetic field from 0 to 15 kG at a frequency of 9 MHz, using inductive means for both generation and detection of the acoustic wave. It is shown that no simple modification of the free electron calculation can account for the measured enhancement of the zero field electromagnetic generation amplitude. Measurements of the electromagnetic to acoustic generation efficiency was also performed on thick aluminum films evaporated onto an insulating substrate. Dissert. Abstr.

N75-22095*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
AMPLIFICATION, ATTENUATION, AND DISPERSION OF SOUND IN INHOMOGENEOUS FLOWS
Czeslaw P. Kentzer 15 Apr. 1975 16 p refs Presented at the 89th Meeting of the Acoust. Soc. of Am., Austin, Tex., 7-11 Apr. 1975
(Grant NGR-15-005-174)
(NASA-CR-142647; AA-75-1) Avail: NTIS HC $3.25 CSCL 20A

First order effects of gradients in nonuniform potential flows of a compressible gas are included in a dispersion relation for sound waves. Three nondimensional numbers, the ratio of the change in the kinetic energy in one wavelength to the thermal energy of the gas, the ratio of the change in the total energy in one wavelength to the thermal energy, and the ratio of the dilatation frequency (the rate of expansion per unit volume) to the acoustic frequency, play a role in the separation of the effects of flow gradients into isotropic and anisotropic effects. Dispersion and attenuation (or amplification) of sound are found to be proportional to the wavelength for small wavelength, and depend on the direction of wave propagation relative to flow gradients. Modification of ray acoustics for the effects of flow gradients is suggested, and conditions for amplification and attenuation of sound are discussed. Author

N75-22096# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
NEW TEMPERATURE COMPENSATED MATERIALS FOR SAW DEVICES
Paul H. Carr 1974 6 p refs
(AD-A003410; AFCRL-TR-74-0564) Avail: NTIS CSCL 09/1

Large-bandwidth surface acoustic wave (SAW) devices are in general not small, lightweight, and energy conserving. This is due to the ovens and other energy consuming schemes which are required to compensate for the large temperature coefficient of lithium niobate. Narrow-band SAW devices have, on the other hand, achieved their potential for being small, lightweight, and passive devices due to the temperature-compensated ST-cut of quartz. This paper discusses developments leading to low loss materials with piezoelectric coupling greater than quartz and ultimately comparable to lithium niobate. The major milestone towards this goal has been the discovery of a physical model for describing why known materials are temperature compensated. In searching for new temperature compensated materials, one looks for open lattice structures in which sizable rotations can occur. Promising materials are identified. GRA

N75-22097# Applied Hydro-Acoustics Research, Inc., Rockville, Md.
EXPERIMENT DESIGN AND TEST PLAN FOR THE MEASUREMENT OF THE SURFACE REFLECTION COEFFICIENT Interim Report
M. R. Serbyn 20 Feb. 1974 23 p refs
(Contract N00167-74-C-0015)
(AD-A003093; TR-117) Avail: NTIS CSCL 17/1

This report presents methods for the acquisition and processing of data necessary to compute the reflection coefficient of sound at the air-water interface. Particular emphasis is placed on techniques based on cross correlation and cross spectral density measurements. Criteria for the applicability of each method are discussed in detail and a general test plan is outlined. GRA

N75-22098# Transport and Road Research Lab., Crowthorne (England).
ROLLING NOISE AND VEHICLE NOISE
D. G. Harland 1974 19 p refs
(PB-239210/8; TRRL-LR-652) Avail: NTIS HC $3.25 CSCL 13B

For the purpose of the report vehicle noise is considered to consist of two parts, power train noise and rolling noise. Vehicles are classified by total noise into two groups and simplified descriptions of vehicle noise as a function of speed are presented. Estimates of rolling noise are compared with the vehicle noise relation. It is shown that rolling noise is the dominant noise source for light vehicles travelling in top gear, and that it makes a measurable contribution both to the noise made by heavy vehicles when travelling in top gear and to the noise of light vehicles under urban conditions. Rolling noise is shown to limit the possibilities for developing quiet vehicles. Rolling noise was the subject of a number of experimental studies, and these are briefly reviewed. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-22099 Florida Univ., Gainesville.
STRUCTURE OF GLASSY FILMS CONTAINING ARSENIC, SELENIUM AND TELLURIUM Ph.D. Thesis
Jenn Chang 1974 126 p
Avail: Univ. Microfilms Order No. 75-3481

The local atomic structure of glassy films containing arsenic, selenium, and tellurium was studied by electron diffraction radial distribution analysis. Measurements were carried out systematically on a series of films of different composition, and the results were compared with diffraction calculations performed for various structural arrangements. Comparison of rdfs from amorphous films and from microcrystallite models shows that the local atomic order of As2Se3 glassy films is similar to that of crystalline As2Se3, but the local atomic order of As2Te3 glassy films differs from that of crystalline As2Te3. The radial distribution functions indicate that these glassy films are essentially solid solutions having a nearest coordination number close to 2.4. Results on films of other compositions are presented and discussed. The influence on crystallization of contact with certain metals and the possibility of phase separation of the glassy films are discussed. Dissert. Abstr.

N75-22100 California Univ., Santa Cruz.
A CROSSED MOLECULAR BEAM AND TUNABLE LASER APPARATUS APPLIED TO REACTIVE SCATTERING STUDIES Ph.D. Thesis
Carlo Parravano 1974 160 p
Avail: Univ. Microfilms Order No. 75-4500

The design and construction of a crossed molecular beam apparatus is described. This apparatus is used in conjunction with a tunable laser to study interactions between excited state atoms and molecules. Dissert. Abstr.

N75-22101 Wisconsin Univ., Madison.
A QUANTUM MECHANICAL KINETIC THEORY OF MODERATELY DENSE GASES WITH ATTRACTIVE INTERACTIONS Ph.D. Thesis
Richard Dale Olmsted 1974 196 p
Avail: Univ. Microfilms Order No. 74-24738

A systematic kinetic theory valid is developed that is for potentials which produce attractive as well as repulsive forces. The approach is based on a truncation of the quantum mechanical BBGKY hierarchy at the level of three particle interactions. Solution of the third BBGKY equation is effected, within the ternary collision approximation, to yield an approximate triplet Wigner distribution function. This triplet distribution function is obtained as a functional of the pair and singlet distribution functions by the imposition of a generalization of the molecular chaos hypothesis. The first two BBGKY equations in conjunction with the triplet distribution function provide a closed set of coupled integro-differential equations to be solved for the pair and singlet distribution functions. Dissert. Abstr.

N75-22102 North Texas State Univ., Denton.
A THEORETICAL INVESTIGATION OF BOUND ROTON PAIRS IN SUPERFLUID HELIUM-4 Ph.D. Thesis
Shih-ta Cheng 1974 175 p
Avail: Univ. Microfilms Order No. 75-7032

The Bogoliubov theory of excitations in superfluid helium is used to study collective modes at zero temperature. A repulsive delta function shell potential is used in the quasiparticle excitation energy spectrum to fit the observed elementary excitation spectrum. The linearized equation of motion method is used to obtain the secular equation for a collective mode consisting of a linear combination of one and two free quasiparticles of zero total momentum. It is shown that in this case for high-lying collective modes only vertices involving four quasiparticles are important. A decomposition into various angular momentum states is made. Bound roton pairs in the angular momentum D-state observed in light-scattering experiments exist only for an attractive coupling between helium atoms. The interaction between particles is reinterpreted as a phenomenological attractive coupling between quasiparticles, in order to explain the Raman scattering from bound roton pairs in superfluid helium. Dissert. Abstr.

N75-22103*# Kanner (Leo) Associates, Redwood City, Calif.
ELECTRON EMISSION CURRENTS OF METALS COVERED WITH ATOMIC LAYERS
S. Wagner Washington NASA Mar. 1975 18 p refs Transl. into ENGLISH from Wiss. Z. Univ. Rostock, Math.-Naturwiss. Reihe, Sonderh. (Rostock), v. 16, no. 7, 1967 p 887-892
(Contract NASw-2481)
(NASA-TT-F-16173) Avail: NTIS HC $3.25 CSCL 20H

A physical model is given for the evaporation equilibrium process of atoms on electron emitters made of metal; concrete parameters are placed into its general framework. The model considered explains the experimental results in a qualitative manner, but for the quantitative interpretation of the measured curves, additional assumptions and sophistications are needed. By means of an experimental example, the importance of an adequate calculation of the average work function and emission current density is demonstrated. Author

N75-22104# Atomic Energy of Canada Ltd., Chalk River (Ontario).
MATERIALS RESEARCH IN ATOMIC ENERGY OF CANADA LIMITED
1974 26 p refs
(AECL-4842) Avail: ERDA Depository Libraries HC $4.50; Atomic Energy of Can., Ltd., Chalk River $1.00

Research programs are summarized on dynamic elastic properties of materials, effects of aging and irradiation on corrosion of Zr-2.5 wt.% Nb, creep resistance of Zr-2.5 wt.% Nb, strengthening of Zr alloys, fracture of 403 stainless steel, and radio-induced swelling of UO2. NSA

N75-22105# Academia R. P. R., Bucharest.
BASIC CONCEPTS IN RADIOMETRIC PROCEDURES
E. Ciobanu and F. Rebigan 1974 26 p refs In RUMANIAN; ENGLISH summary
(IFA-TEN-1-1974) Avail: ERDA Depository Libraries HC $4.50

A review is made of the basic concepts and notions commonly used in measuring techniques as well as the general principles of the treatment of experimental data obtained with radiometric devices. An attempt is made to clarify and define concepts such as standardization and calibration, precision, and accuracy. These are critically presented and adapted to meet modern needs. Attention is drawn to a complete characterization of the radiometric devices in terms of metrological (physical), technical, and radio-protection quantities. Author (NSA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N75-22106 Virginia Univ., Charlottesville.
RADIATION DAMAGE IN Ge(Li) DETECTORS Ph.D. Thesis
Joseph McKee Graf 1974 278 p
Avail: Univ. Microfilms Order No. 75-4679

Lithium drifted germanium gamma ray detectors were systematically exposed to reactor spectrum neutrons in order to measure the fluence level at which radiation damage severely deteriorates detector resolution. Dependence of resolution, leakage current and capacitance on fast neutron fluence as well as the recovery of the detectors by annealing were examined in terms of proposed radiation damage models. It was found that these detectors could tolerate a fluence of 10 to the 9th power n/sq cm. Above this level all three detectors showed signs of deterioration. Restoration of good energy resolution was achieved by warming the detector to room temperature for approximately two hours. Redrifting the detector restored the diode leakage current and capacitance characteristics, but did not significantly improve the resolution over that following the warm-up to room temperature. Dissert. Abstr.

N75-22107# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
HIGH-ENERGY BEAMS AND MAGNETIC SPECTROMETERS, PART 1 [FASCI DI ALTA ENERGIA E METODI ANALISI MAGNETICA, PARTE 1]
G. Matthiae 20 Aug. 1974 67 p refs In ITALIAN
(ISS-L-74/7) Avail: NTIS HC $4.25

The properties of dipole and quadrupole magnets are discussed together with their combined use in the beam transport systems. Commonly used methods of magnetic analysis are reviewed, and several examples of charged particle spectrometers are presented. Author

N75-22108*# National Aeronautics and Space Administration, Washington, D.C.
NONEQUILIBRIUM RADIATION NUCLEAR REACTOR Patent Application
Karlheinz Thom (Fla. Univ., Gainesville) and Richard T. Schneider, inventors (to NASA) (Fla. Univ., Gainesville) Filed 21 Mar. 1975 18 p Sponsored by NASA
(NASA-Case-HQN-10841-1; US-Patent-Appl-SN-560891) Avail: NTIS HC $3.25 CSCL 18L

An externally moderated thermal nuclear reactor is disclosed which is designed to provide output power in the form of electromagnetic radiation. The reactor is a gaseous fueled nuclear cavity reactor device which can operate over wide ranges of temperature and pressure, and which includes the capability of processing and recycling waste products such as long-lived transuranium actinides. The primary output of the device may be in the form of coherent radiation, so that the reactor may be utilized as a self-critical nuclear pumped laser. NASA

N75-22109# American Nuclear Society, San Diego, Calif.
PROCEEDINGS OF THE FIRST TOPICAL MEETING ON THE TECHNOLOGY OF CONTROLLED NUCLEAR FUSION, VOLUME 1
G. R. Hopkins, ed. and B. Yalof, ed. Apr. 1974 710 p refs

Conf. held at San Diego, Calif., 16-18 Apr. 1974 Sponsored by ERDA
(Conf-740402-P1-Vol-1) Avail: NTIS HC $17.25

Abstracts of papers presented on the development of fusion and fission processes for use as a power generation source are given. J.M.S.

N75-22110# Columbia Univ., New York.
ABNORMAL NUCLEAR STATES
T. D. Lee Jul. 1974 20 p refs Presented at the 17th Intern. Conf. on High-Energy Phys., London, 1 Jul. 1974 Sponsored by ERDA
(COO-2271-39; Conf-740713-34) Avail: NTIS HC $3.25

It has been suggested that, if there exists a strongly interacting O(+) meson, then there exists the possibility of abnormal nuclear states, hitherto unobserved. The simple quasi-classical arguments that led to such a suggestion are reviewed, and then its theoretical basis is examined in the context of a relativistic quantum field theory. A simple renormalizable theory consisting of a spin-0 Hermitian field and a spin-1/2 nucleon field is considered. If the nucleon density is sufficiently high, the system may exist in an abnormal nuclear state, in which the effective nucleon mass becomes zero, or nearly zero. The sigma model is discussed in this connection. NSA

N75-22111# Columbia Univ., New York.
ABNORMAL NUCLEAR STATES AND VACUUM EXCITATIONS
T. D. Lee 1974 19 p refs Presented at the Intern. School of Subnucl. Phys., Erice, Italy, 14 Jul. 1974 Sponsored by ERDA
(COO-2271-43; Conf-740731-1) Avail: NTIS HC $3.25

The purpose of this admittedly speculative work was to investigate the structure of the vacuum; it led to the suggestion of the possible existence of some hitherto unobserved physical objects. The existence of a strongly interacting neutral spin-0 even-parity meson (or resonance) is assumed. It can be represented by ph(x) in a rather large volume Omega. If omega is filled with nuclear matter, one may obtain abnormal nuclear states; if it does not contain any nuclear matter, pure vacuum excitation states. Abnormal states are those in which the effective nucleon mass inside the nucleus is approximately zero. They are discussed in connection with the micron model. Under certain conditions the abnormal state is stable; it is the lowest energy state with a substantially larger binding energy per nucleon than that in the normal state. In a collision between an abnormal nuclear state and a normal nucleus occasionally a new object called the vacuum excitation state will result. NSA

N75-22112# Oak Ridge National Lab., Tenn.
NUCLEAR REACTOR PROCESS HEAT CAPABILITIES, POTENTIAL, AND ECONOMICS
D. B. Trauger and L. L. Bennett 1974 4 p Presented at the 1st Natl. Topical Meeting on Nuclear Process Heat Appl., Los Alamos, New Mexico, 1 Oct. 1974 Sponsored by ERDA
(Conf-741032-1) Avail: NTIS HC $3.25

A present-day limitation of nuclear power plants is that they are all steam producers, whereas many industries need high-temperature process heat in addition to steam. Achievement of high temperature capabilities would allow the gas-cooled reactors to supply process heat as well as industrial steam requirements. The cost of steam from nuclear reactors for industrial uses was evaluated. Nuclear energy costs were compared with coal or refined-coal fuels at a U.S. Gulf Coast location. These studies indicate that, in large sizes, the LWR and HTGR can provide process steam at lower cost than coal-based plants. While the CNSG is smaller than conventional LWRs, and therefore a more appropriate size for many industrial applications, the unit energy cost is significantly higher than from larger nuclear plants (due to economies of scale) or from a variety of coal fuel cycles. Author (NSA)

N75-22113# California Univ., Livermore. Lawrence Livermore Lab.
ADVANCED CONCEPTS IN FUSION-FISSION HYBRID REACTORS
J. A. Maniscalco and L. L. Wood 26 Jul. 1974 40 p refs Presented at Am. Nucl. Soc. Natl. Meeting, Washington, D. C., 27 Oct. - 1 Nov. 1974 Submitted for publication Sponsored by ERDA
(UCRL-75835; Conf-741086-6) Avail: NTIS HC $3.75

Fusion-fission hybrid reactors are viewed as sub-critical nuclear fission reactors driven and controlled by an internal high energy neutron source the fusion reactor. Such hybrids combine naturally the neutron richness of fusion power sources with the power richness of fission sources, thereby eliminating the intrinsic power poverty and neutron deficiency of these respective sections. Also eliminated in uncontrived fashions are the somewhat marginal specific tritium breeding rates of relistic fusion power reactor designs, the low specific fissile material breeding rates of conventional fast breeder fission reactors, the criticality control problems of fast breeder reactors, the demands of both fast breeder and light water reactors for both mined uranium and separative work capacity, and possible cost and technology complexity problems of fusion power reactor designs. Dissert. Abstr.

N75-22114# Army Foreign Science and Technology Center, Charlottesville, Va.
RESULTS OF WORK ON THERMOEMISSION CONVERSION
D. Karetnikov 20 May 1974 5 p Transl. into ENGLISH from Russian paper presented at an Intern. Meeting on Thermionics, Vienna, 1972
(AD-A002655; FSTC-HT-23-147-74) Avail: NTIS CSCL 10/2

The paper reports that tests of the TOPAZ-3 thermionic reactor, similar in design to its 2 predecessors, began in 1972. By 1 March 1973, it had operated about 3000 hours at 5-7 kV, and efficiency was 30% higher than that of the first reactors. At the same time, tests of 1- and 5-element generating channels were conducted, with a 5-element channel operating for over 3000 hours at 1.7 W/sq cm. A single element with tungsten-rhenium emitter and niobium collector operated 2670 hours with initial power density of 7 W/sq cm dropping to nearly 3.5 W/sq cm by the end of the test. Unexpectedly great reduction in neutral component concentration was found in theoretical-experimental study of nonstationary cesium plasma. A triode thermionic converter, as a high-temperature thyratron, using a cesium-barium mixture at low pressure can close the circuit at up to 100 V, cathode temperature 1600C, current density up to 20 A/sq cm and voltage drop of not over 5 V. GRA

74 OPTICS

Includes light phenomena.

N75-22115 Washington Univ., Seattle.
LIGHT SCATTERING FROM FUZZY SPHERES: A STUDY OF THE EFFECTS OF SURFACE STRUCTURE AND A MODEL FOR INHOMOGENOUS AND NONSPHERICAL PARTICLES Ph.D. Thesis
John Harlan Herbert 1974 409 p
Avail: Univ. Microfilms Order No. 75-3993

Spheres with diffuse surfaces for modelling light scattering from aerosol particles were used to learn which aspects of light scattering reveal the most information about particle surface structure, and to investigate a simple model of scattering from inhomogeneous and nonspherical aerosol particles (the starting point for the distorted wave Born approximation). All characteristics of light scattered from ensembles of fuzzy spheres were calculated over the full range of scattering angles. It is found that the distributions of particles sizes and the refractive indices of their cores are typical of those reported for an atmospheric aerosols. Several aspects of the scattering behavior yield reliable information on the thicknesses of the surface layers of the fuzzy spheres, and distinguish differences in surface thickness from differences in the real and the imaginary parts of the refractive index. The calculated scattering from both fuzzy spheres and conventional, homogeneous spheres were compared with published measurements on large, nonspherical aerosol particles. Dissert. Abstr.

N75-22116 State Univ. of New York, Stony Brook.
OPTICAL IMAGE PROCESSING METHODS FOR HIGH RESOLUTION ELECTRON MICROSCOPY AND OTHER SYSTEMS WITH CIRCULAR SYMMETRY Ph.D. Thesis
Venugopal Srinivasan 1974 103 p
Avail: Univ. Microfilms Order No. 75-5100

Experimental techniques are reported that utilize computer aided synthesis of filters for carrying out coherent optical processing for the class of systems characterized by circularly symmetric transfer functions. As a particular and practical case, application of these methods to high resolution electron microscopy together with the results of experiments performed on actual electron micrographs are discussed. Extension of the method to other areas of optical processing is outlined and some experimental results involving Wiener filtering for noise suppression are given. Dissert. Abstr.

N75-22117 Colorado State Univ., Fort Collins.
A STOCHASTIC CANOPY MODEL OF DIURNAL REFLECTANCE Ph.D. Thesis
Robert Edward Oliver 1974 148 p
Avail: Univ. Microfilms Order No. 75-4605

As a means of investigating the interaction of shortwave radiation with vegetation, a stochastic canopy model was developed which utilizes random variables based on measured distributions for incoming radiation flux, intrinsic optical properties, and canopy geometry. Two methods are described for determining canopy geometry. A portable battery powered spectrometer system was constructed for the measurement of vegetation apparent directional reflectance, and provides data for model validation and horizontal surface irradiance measures required as model input. A direct application of the model is to simulate statistical spectral signatures for use with remote sensing pattern recognition algorithms. A qualitative study was made to investigate the effects of changing canopy directional reflectance on feature selection. The results show that different combinations of wavelength channels are appropriate for various sensor look angles, that target signature have greater statistical separation for some scan angles than others, and that these effects are time varying. Dissert. Abstr.

N75-22118*# Scientific Translation Service, Santa Barbara, Calif.
APPLICATION OF THE NORMALIZED VASICEK METHOD TO NONABSORBING SINGLE VAPOR-DEPOSITED LAYERS ON GLASS CARRIERS
Juergen Rassow Washington NASA Apr. 1975 24 p refs Transl. into ENGLISH from Z. Physik. (Berlin), v. 170, 1962 p 376-392
(Contract NASw-2483)
(NASA-TT-F-16261) Avail: NTIS HC $3.25 CSCL 20F

Vasicek's polarimetric theory was modified to a graphic method for determination of optical constants of thick homogeneous films on glass carriers. The method is verified for single layers deposited by heating salts, and the kind of salt determines the gradient of the refractive index. This gradient and the state of the glass surface are responsible for deviations from the theoretical curves. A suitable method was found for determining the refractive index and the thickness of the deposited film. In a modified form the method can also be used for inhomogeneous films. Author

N75-22119*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
WINDOW DEFECT PLANAR MAPPING TECHNIQUE Patent Application
Fred R. Minton (Rockwell Intern.) and Uel O. Graham, inventors (to NASA) (Rockwell Intern.) Filed 14 Mar. 1975 10 p
(Contract NAS9-14000)
(NASA-Case-MSC-19442-1; US-Patent-Appl-SN-558600) Avail: NTIS HC $3.25 CSCL 20F

A method of window defect planar mapping is presented. The windows are edge lighted by fiber optics and light sensitive contact paper is applied to the surface of the windows. When the light source is activated, the windows are illiminated, and the light sensitive paper is exposed. A photographic record of window defects is provided upon subsequent chemical development of the light sensitive paper. NASA

N75-22120# Lockheed Missiles and Space Co., Palo Alto, Calif.
INFLUENCE OF TURBULENCE OF THE ATMOSPHERE ON OPTICAL SIGNAL RECEPTION, CHAPTER 7
Iu. A. Skomorovskii and V. A. Rozhanskii [1975] 10 p refs Transl. into ENGLISH from the book "Peredacha Soobshchenii po Opticheskim Liniiam Sviazi" Moscow, Sviaz, 1974 p 182-191
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Statistical characteristics of the atmosphere (the local temperature, the humidity, and the air density fluctuations) are found to cause changes in the refractive index which in turn cause fluctuations in the amplitude, phase, and polarization of a light beam passing through the atmosphere. The interference-immunity of optical communication lines were examined for the reception of optical pulses under conditions of a turbulent atmosphere. The interference-immunities of optical signal receivers with AGC in the optical and radio channels are discussed. M.J.S.

N75-22121*# Optical Science Consultants, Yorba Linda, Calif.
ANALYSIS OF APERTURE AVERAGING MEASUREMENTS Final Report, 2 Jun. 1974 - 2 Mar. 1975
David L. Fried Mar. 1975 134 p refs
(Contract NAS5-20537)
(NASA-CR-143717; DR-041) Avail: NTIS HC $5.75 CSCL 20F

Laser scintillation data obtained by the NASA Goddard Space Flight Center balloon flight no. 5 from White Sands Missile Range on 19 October 1973 are analyzed. The measurement data, taken with various size receiver apertures, were related to predictions of aperture averaging theory, and it is concluded that the data are in reasonable agreement with theory. The following parameters are assigned to the vertical distribution of the strength of turbulence during the period of the measurements (daytime), for lambda = 0.633 microns, and the source at the zenith; the aperture averaging length is d sub o = 0.125 m, and the log-amplitude variance is (beta sub I)2 = 0.084 square nepers. This corresponds to a normalized point intensity variance of 0.40. Author

N75-22122*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
MULTI-MODE OPTICAL SENSOR (B) EVALUATION TEST REPORT
R. A. Smith 3 Jan. 1975 53 p
(Contract NAS9-12200)
(NASA-CR-141764; LEC-5187; JSC-09302) Avail: NTIS HC $4.25 CSCL 20F

An evaluation test series was performed on the unit to develop realistic specifications for a similar device for use on the orbiter vehicle. Tests included sensitivity, target dynamic range, tracking angular rate, external magnetic field effects, and photocathode uniformity. Several demonstrations of operation under automatic control were also prepared, using a desk calculator for numerical control and for subsequent reduction of data derived from the test. Author

N75-22123# Metavac, Inc., Flushing, N.Y.
PRODUCTION ENGINEERING MEASURES FOR FILTER, INFRARED INTERFERENCE-ABSORPTION TYPE Quarterly Report, 1 Jun. - 31 Aug. 1974
John Monte 10 Oct. 1974 34 p refs
(Contract DAAB07-74-C-0379)
(AD-A002749; QR-1) Avail: NTIS CSCL 20/6

The purpose of the work is to develop technical and production engineering measures and methods for the rapid manufacture of a Near Infrared Transmitting, Visible Light Absorbing Filter for the Infrared Searchlight AN/VSS-3A, the 1 kilowatt type. The filter assembly to be manufactured consists of two glass cylinders, one or both tinted chemically, and each coated with a multilayer interference coating so that the transmission of visible radiation is minimized, while the near infrared transmission is maximized. GRA

N75-22124# Aerospace Corp., El Segundo, Calif. Lab. Operations.
IRRADIANCE FLUCTUATIONS AS A SPHERICAL WAVE

PROPAGATING UNDER SATURATION CONDITIONS
Interim Report
Hal T. Yura 17 Dec. 1974 22 p refs
(Contract F04701-74-C-0075)
(AD-A003406; TR-0075(5230-30)-1; SAMSO-TR-74-270)
Avail: NTIS CSCL 20/6

The recent physical model of strong optical scintillation of plane waves is extended to the case of spherical-wave propagation. The spherical-wave amplitude filter function is derived and compared to the corresponding plane-wave result. Specifically, the spherical- to plane-wave log-amplitude-variance ratio is calculated. For weak fluctuations, our results are identical to the results of perturbation theory, where the spherical-wave log-amplitude variance is less than the corresponding plane-wave result. On the other hand, for strong fluctuations (i.e., in the saturation regime), it is shown that the plane- and spherical-wave log-amplitude variances saturate to the same constant value. Additionally, expressions are presented in the saturation regime for the plane- and spherical-wave log-amplitude covariance function and compared with the corresponding results in the regime of weak fluctuations. GRA

N75-22125# Army Foreign Science and Technology Center, Charlottesville, Va.
OPTICAL RANGEFINDERS AND ALTIMETERS OF THE GEOMETRICAL TYPE
I. A. Greim 6 Apr. 1974 270 p refs Transl. into ENGLISH from the book "Optich. Dalnomery i Vysotometry Geometricheskogo Tipa" Moscow, Nedra Press, 1971 176 p
(AD-A003000; FSTC-HT-23-1023-73) Avail: NTIS CSCL 17/8

The optical elements of rangefinders and their classification into groups with the base at the target station and with the base at the instrument are presented. Linear optical converters using aberration-free plane mirrors are discussed. Nonlinear optical converters using telescopic lenses are analysed. Semiautomatic and automatic rangefinders with the base at the instrument conclude the text. GRA

N75-22126# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
COVARIANCE OF THE INTENSITY FLUCTUATIONS OF A WAVE IN A RANDOM MEDIUM Physical Sciences Research Papers
Ronald L. Fante 27 Sep. 1974 39 p refs
(AF Proj. 2153)
(AD-A003384; AFCRL-PSRP-604; AFCRL-TR-74-0478) Avail: NTIS CSCL 20/6

A new theory for the normalized covariance B sub I(z,r) in the intensity fluctuations of a plane wave in a random medium is reported where the first term is sharply peaked and corresponds to the rapid dropoff in B sub I(R) observed experimentally. The second term varies very slowly with R and corresponds to the long tail of B sub I(R) seen in experiments. Unlike other theories this theory is completely self-contained, and does not involve the introduction of any arbitrary cutoff parameters. Also studied is the variance in the intensity fluctuations of a finite beam in a random medium for the case where the properties of the variance B sub I(z,o) are independent of initial beam structure. Author

N75-22127# Aerospace Corp., El Segundo, Calif. Lab. Operations.
BAND MODEL FORMULATION FOR INHOMOGENEOUS OPTICAL PATHS Interim Report
Stephen J. Young 19 Dec. 1974 43 p refs
(Contract F04701-74-C-0075; ARPA Order 2843)
(AD-A003403; TR-0075(5647)-4; SAMSO-TR-74-255) Avail: NTIS CSCL 20/6

The band model formulation developed by Lindquist and Simmons to handle radiance calculations for highly inhomogeneous and nonisothermal optical paths is discussed and extended. The original formulation was based on the statistical band model for a random array of equal-intensity pressure-broadened Lorentz lines. Here, the formulation is extended to include bands of constant-intensity Doppler lines and bands of Lorentz or Doppler lines with an exponential distribution of line strengths. Results are presented for the equivalent width derivative functions y(x, rho) for the constant-intensity Lorentz, constant-intensity Doppler, and exponential-intensity Doppler cases. Various approximations to these functions for extreme x and rho conditions are also presented. A closed-form solution for y(x, rho) is given for the exponentially distributed Lorentz line case. GRA

N75-22128# Hughes Research Labs., Malibu, Calif.
INTEGRATED OPTICS Final Report, 1 Jun. 1972 - 30 Aug. 1974
G. Sanjiv Kamath, Amnon Yariv, R. G. Hunsperger, Michael Barnoski, and Steven Jensen Oct. 1974 158 p refs
(Contract F19628-72-C-0322; ARPA Order 2074)
(AD-A003408; AFCRL-TR-74-0542) Avail: NTIS CSCL 20/6

The objectives of this program were to study and analyze the propagation, attenuation, modulation, and detection of coherent optical waves in thin film waveguides, in particular, epitaxial semiconductor structures at a wavelength of 8500 A, to determine the parameters controlling the solution regrowth epitaxy of the Ga(1-x)Al(x)As system, to study the influence of the index discontinuity and semiconductor carrier concentration on optical properties, and to develop the elementary optical device elements. Early in the program the authors conducted theoretical and experimental studies to define the epilayer material and structure requirements for factors affecting waveguiding. The results described in this report demonstrate that Ga(1-x)Al(x)As epitaxy is a practical means of producing low loss waveguides for integrated optics and that monolithic device elements can also be produced on the wafer. However some additional work is needed to fully optimize waveguide structures, and much work is required to develop practical monolithic device elements for optical integrated circuits. GRA

N75-22129# National Inst. of Law Enforcement and Criminal Justice, Washington, D.C.
SIMPLIFIED PROCEDURES FOR EVALUATING THE IMAGE QUALITY OF OBJECTIVE LENSES FOR NIGHT VISION DEVICES
Charles Grover May 1974 22 p refs
(PB-238567/2; LEAA-LESP-RPT-0304-00) Avail: NTIS MF $2.25; SOD HC $0.60 CSCL 20F

Users of night vision devices (NVD) in law enforcement work may at some time desire to modify the capability of their NVD by employing a photographic lens. This report describes two methods of testing the suitability of such photographic lenses for use with particular NVD's. These methods described are the low contrast resolution test (LCRT) and the variable contrast resolution test (VCRT). Both evaluate a photographic lens' limiting resolution at a particular contrast level or as function of contrast. Although the CVRT is more complex and provides better overall evaluation, both precedures have correlated well with lens ranking data obtained by complicated modulation transfer function methods and are recommended as simple criterion tests for lens suitability. Illustrative graphs and photographs are provided. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-22130 Maryland Univ., College Park.
A THEORETICAL INVESTIGATION OF THE ELECTRODE BOUNDARY CONDITIONS IN MAGNETOHYDRODYNAMIC GENERATORS Ph.D. Thesis
Scott Logan Thomson 1974 79 p
Avail: Univ. Microfilms Order No. 75-4959

The voltages across opposite electrodes in experimental Faraday magnetohydrodynamic generators are less than the ideal values. The interaction of the generator plasma with the electrodes is considered as the mechanism for the unexplained voltage loss. The plasma near the electrodes is treated with a constant temperature, one-dimensional theory that includes ionization relaxation. An ionization region is defined that is smaller than the channel height and greater than the region where charge

separation effects are important. The region between the ionization region and the electrode is collisionless and subject to the voltages associated with charge separation. The closed form models for the ionization region and collisionless region are matched at their boundary. The voltage and electron number density determined by the matching is used as the boundary conditions for a generator core solution. Numerical calculations are performed for several hypothetical and experimental generators. The dominant voltage loss is found to occur at the cathode and to be a strong function of both the plasma and surface properties. As the load current is increased, the ionic current becomes a greater proportion of the total current and accounts for the measured independence of the voltage loss from the load current.
Dissert. Abstr.

N75-22131 Polish Academy of Sciences, Warsaw.
EXISTENCE AND EXPLICITNESS OF SOLUTIONS FOR NONLINEAR EQUATIONS OF PLASMA ELECTRODYNAMICS IN A KINETIC DESCRIPTION [ISTNIENIE I JEDNOZNACZNOSC ROZWIAZAN DLA NIELINIOWYCH ROWNAN ELEKTRODYNAMIKI PLAZMY W OPISIE KINETYCZNYM]
Jacek Duniec 1973 60 p refs In POLISH
(Rept-11/1973) Avail: Issuing Activity

The formation is discussed of initial problems leading to theorems about the existence and explicitness of solutions for these equations. A specific model is presented of microscopic media described through a nonlinear system of Vlasov-Maxwell equations. By selecting the corresponding Banach space for the function describing the plasma state and by accepting the corresponding assumption about given initial functions (initial values), the local existence and explicitness were proven of relativistic solutions, of one dimensional Vlasov-Maxwell equations in support of functional analysis by the law of constricted representations. Transl. by M.J.S.

N75-22132 Polish Academy of Sciences, Warsaw.
RELATION OF PLASMA RESISTANCE WITH AUTOCORRELATIONS OF AN ELECTRICAL FIELD IN THE PRESENCE OF AN ELECTRICAL FIELD [ZWIAZEK REZYSTYWNOSCI PLAZMY Z AUTOKORELACJAMI POLA ELEKTRYCZNEGO W OBECNOSCI POLA MAGNETYCZNEGO]
Krzysztof Zuchowski 1974 17 p refs In POLISH
(Rept-9/1974) Avail: Issuing Activity

The use of a phenomenological, generalized Langevin equation was investigated for the case when a constant magnetic field exists. Other topics discussed include Liouville equations, magnetic induction, Debye length, Markov processes, Fokker-Planck equation, Fourier analysis, and the Laplace equation.
Transl. by M.J.S.

N75-22133# Los Alamos Scientific Lab., N.Mex.
PLASMA EXPERIMENTS IN THE SCYLLAC TOROIDAL THETA PINCH
E. L. Cantrell, W. R. Ellis, and H. W. Harris 1974 10 p refs Presented at 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1549; Conf-741105-37; IAEA-CN-33/E1-2) Avail: NTIS HC $3.25

Experiments are reported on plasma equilibrium and stability in the Scyllac full torus, and in earlier 5-m and 8-m toroidal sectors. The outward toroidal drift was compensated by a combination of 1 = 1 helical and 1 = 0 bumpy fields generated by shaping the inner surface of the compression coil or by driven 1 = 1 windings. Time resolved measurements of the gross plasma column motion, plasma radius, excluded flux, external magnetic field, plasma density, electron and ion temperatures, and plasma beta were made. Results show that the plasma behavior in the 8-m sector and the full torus is qualitatively the same, with a well-defined, theta-pinch type plasma column being formed in both cases. The plasma confinement lasts typically 6-10 microns, and is terminated by a long-wavelength, m = 1 type motion which carries the plasma column to the wall with an effective growth rate. Author (NSA)

N75-22134# Naval Research Lab., Washington, D.C.
FEASIBILITY STUDY OF 300-1000 EV ELECTRON TEMPERATURE MEASUREMENTS OF A LOW-DENSITY (n IS APPROXIMATELY 10 TO THE 14th POWER PER CUBIC CENTIMETERS) TRANSIENT (t IS APPROXIMATELY 100 nsec) PLASMA IN THE TRITON EXPERIMENT USING BERYLLIUM FOILS, L-EDGE ROSS FILTERS AND PHOTOELECTRIC DETECTORS Interim Report
B. Grant Logan (Calif. Univ. Livermore, Lawrence Livermore Lab.) and Kent A. Gerber Nov. 1974 40 p refs Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(AD-A002729; NRL-MR-2917) Avail: NTIS CSCL 20/9

Various techniques of low-energy X-ray measurements useful in the determination of electron temperatures are evaluated for application to the energetic (300 - 1000 eV) low-density (n about = 10 to the 14th power/cc) transient (t about = 100 nsec) plasma in the Triton electron beam-plasma interaction experiment. Diagnostic techniques considered include continuum measurements with broad-band beryllium-foil filters, narrow band-pass absorption-edge filters for X-ray energies below 1 keV and gold photoelectric detectors for energies below 400 eV. GRA

N75-22135# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
ENVIRONMENTAL EFFECTS ON AEROSPACE SENSOR SYSTEMS Final Report, 1 Sep. 1969 - 31 Aug. 1974
R. J. Churchill, P. W. Chan, and H. E. Wilhelm Oct. 1974 178 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-A002910; AFCRL-TR-74-0535) Avail: NTIS CSCL 20/9

The following topics are discussed: (1) reentry plasma diagnostics; (2) antennas in compressible plasmas; (3) collision effects in fully ionized plasmas; (4) plasma solid energy transport; (5) turbulent plasmas; (6) laser produced plasmas; (7) ionospheric modeling; (8) optical remote sensing; (9) electromagnetic remote sensing; and (10) signal design and systems analysis. G.G.

N75-22136# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INCIDENCE OF A PLANE ELECTROMAGNETIC WAVE ON A MOVING JUMP IN IONIZED GAS DENSITY
A. S. Blagoveshchenskii and V. V. Borisov 15 Nov. 1974 15 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (USSR), v. 15, no. 9, 1972 p 1314-1319
(AD-A002831; FTD-HT-23-0027-75) Avail: NTIS CSCL 20/9

Plane electromagnetic waves whose velocity is greater than the speed of light were examined. Other topics discussed include electron density, ion density, wave functions, Cauchy problems, Volterra equation, and time dependence. M.J.S.

N75-22137# Naval Research Lab., Washington, D.C.
A MODEL FOR THE PRODUCTION AND TRANSPORT OF ENERGETIC PARTICLES IN A LASER PRODUCED PLASMA
W. M. Manheimer and H. H. Klein Dec. 1974 37 p refs
(NRL Proj. 77H02-29)
(AD-A002943; NRL-MR-2931) Avail: NTIS CSCL 20/9

A model is presented for the production and transport of energetic electrons in a laser produced plasma. The basic assumption is that the laser deposits its energy in the form of a large amplitude plasma wave. The energy is given to particles as the electrostatic wave propagates outward and damps. Theory and simulations show that the maximum energetic particle velocity is between about five and seven thermal velocities, and that the heat flux is limited to about 0.25 n m (V sub e, sup 3). GRA

N75-22138# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
APPLICATION OF PLASMA ACCELERATORS IN THERMONUCLEAR RESEARCH
I. I. Demidenko and N. S. Lomino 20 Nov. 1974 34 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd-vo Mashinostroyeniye, 1972 p 282-301
(AD-A003077; FTD-HC-23-1097-74) Avail: NTIS CSCL 20/9

The problem of transporting plasma flux produced by plasma accelerators is very important. Magnetic fields of various structures are used as plasma guides. Problems of the stability of plasma flux during transport of the plasma by a multipole field are discussed. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-22139 British Library Lending Div., Boston Spa (England).
THE RELATIONSHIP OF THE LATTICE SPACINGS OF Fe-Cr SYSTEM ALLOYS TO TEMPERATURE
T. I. Babyuk, G. P. Kushta, and O. I. Rybailo 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 7, 1974 p 126-128
(BLL-M-25042-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The relationship of the lattice spacings of un-ordered Fe-Cr system solid solutions at 20-1000 C to temperature and concentration have been studied using specimens containing 10.30-90.62 at. % Cr (including the initial components). The changes in the crystal lattice spacings accompanying changes in temperature are not linear over the entire range investigated. The anomalies in the relationship of the lattice spacing to temperature for Fe and Fe + 10.30 at. % Cr are due to magnetic transformations. It has been confirmed that the transformations taking place at 200 C in chromium are not second order phase transitions. Author

N75-22140 California Univ., San Diego.
FILM DEPOSITION OF Nb-BASED A15 SUPERCONDUCTORS Ph.D. Thesis
Lee Walter Kammerdine 1974 165 p
Avail: Univ. Microfilms Order No. 75-4642

The Nb3X, A15 structure alloys with X in the IIIA or IVA column of the periodic table, exhibit the highest superconducting transition temperature (Tc) out of all of the presently known superconductors. In terms of applications, there are two important areas of study: (1) the formation of the high Tc material in a useful, coherent form and (2) the synthesis of new materials that might lead to even higher Tc materials. Two slightly different methods of preparation were employed. In the first part of this investigation Nb3Al and Nb(Al,Ge) (at that time the highest Tc superconductor) were formed by sputtering and were studied for general crystal structure properties and for superconductivity. Lattice constants and Tc were measured and compared with a set of fast-quenched bulk samples, alloyed for that purpose. Dissert. Abstr.

N75-22141 Ohio State Univ., Columbus.
EPR AND LUMINESCENCE OF RARE EARTH IONS IN SINGLE CRYSTAL La2 O2 S Ph.D. Thesis
John W. Jewett 1974 127 p
Avail: Univ. Microfilms Order No. 75-3106

Electron paramagnetic resonance measurements were performed on samples of La2O2S doped inentionally with Tb(+3) and Eu(+3) and unintentionally with Gd(+3) and Pr(+3). The experimental data were analyzed by the use of spin Hamiltonians. Theoretical calculations on the ground states and crystal field splittings were made by computer using the point charge model of the crystal field theory. The splittings were also predicted by a group theoretical analysis. The experimental results showed a new g-value for Tb(+3) which is a result of the unusual splitting caused by the C3y symmetry of the host. In addition, a crystal defect results in a symmetry axis at 45 deg from the crystal c-axis, and the usual results for Tb(+3) in a trigonal symmetry are obtained for those ions in the defect sites. Data for Pr(+3) and Gd(+3) are analyzed. No spectrum was observed from Eu(+3). Dissert. Abstr.

N75-22142 North Carolina Univ., Chapel Hill.
STRUCTURE OF TETRAHEDRALLY COORDINATED AMORPHOUS SEMICONDUCTORS Ph.D. Thesis
I-Li Huang 1974 119 p
Avail: Univ. Microfilms Order No. 75-4830

A simple continuous-random-network (CRN) model of tetrahedrally bonded amorphous semiconductors is presented. The network is characterized by a single parameter and easily generated by the computer. Networks with the same topology as the Polk model and the Henderson-Herman model were obtained. A procedure for rapidly obtaining the Cartesian coordinates of tetrahedrally coordinated CRNs' is presented. The only required information is the topology of the model. Five models including the Pefect lattice, Polk model, Henderson model, and two of our models were tested. Elastic and electronic properties of the various models are investigated using Keating model for the strain energy and the tight-binding Hamiltonian for the electron states. Dissert. Abstr.

N75-22143 Cornell Univ., Ithaca, N.Y.
COMPUTER SIMULATION OF THE RELAXING AVALANCHE MODE, AND ITS RELATION TO TRAPATT, ARP, AND IMPATT OSCILLATORS AND AMPLIFIERS Ph.D. Thesis
Frederick Gerald Zappert 1974 159 p refs
Avail: Univ. Microfilms Order No. 75-4274

Results of a theoretical investigation of large signal nonlinear effects in avalanche semiconductor devices are described. This effort focused on the negative resistance effects obtained below the frequencies characteristic of Read or IMPATT mode operation. A derivation of the partial differential equations relevant to this device is presented. The formulation chosen results in a very rapid, and inexpensive, digital device equations. The principal results obtained from these calculation include the prediction of a current-controlled, high-impedance relaxing avalanche mode negative resistance. The class of oscillators and amplifiers previously designated by the term avalanche resonance pumped are shown to have a firm theoretical basis. Dissert. Abstr.

N75-22144 Washington Univ., Seattle.
THE METALLURGICAL STRUCTURE AND SUPERCONDUCTING BEHAVIOR OF Zr-Nb BINARY ALLOYS Ph.D. Thesis
Sundaram Lakshmi Narasimhan 1974 282 p
Avail: Univ. Microfilms Order No. 75-4023

The superconducting phase transition behavior of zirconium base Zr-Nb alloys has been correlated with their constitution and the microstructural modifications resulting from various thermal and mechanical treatments. The products of beta decomposition through a phase separation process, athermal and isothermal omega reactions and the precipitation of the equilibrium alpha phase, produced prior to and following plastic deformation, have been investigated for their potential flux pinning effects in the superconducting mixed state. Based on the critical state model of flux pinning in superconductors, the critical current densities and the pinning force densities have been determined for the various flux pinning agents observed. Structural and microstructural correlations were obtained using X-ray and transmission electron microscopy techniques. Dissert. Abstr.

N75-22145 Stanford Univ., Calif.
PHOTOELECTRONIC PROPERTIES OF CHEMICALLY DEPOSITED CADMIUM SULFOSELENIDE FILMS Ph.D. Thesis
Robert Saul Feigelson 1974 114 p
Avail: Univ. Microfilms Order No. 74-27017

The photoelectronic properties of polycrystalline cadmium sulfoselenide solid-solution thin films prepared by a chemical spray deposition process were investigated. The research included a study of (1) techniques for film preparation, (2) heat treatment techniques to enhance photosensitivity, and (3) crystallographic structure, photoelectronic and optical properties of the films produced. By comparison with other techniques for thin film preparation, the chemical-spray deposition method offers a greater degree of flexibility with regard to controlling crystallinity, composition and thickness. The domination of electrical transport by the properties of inter-grain boundaries, however, limits the utility of these films in applications requiring high mobility, long-term stability or environmental independence. Dissert. Abstr.

N75-22146 California Univ., Los Angeles.
THE ELECTRICAL AND OPTICAL PROPERTIES OF THIN FILMS OF TITANIUM MONONITRIDE AND CARBIDE Ph.D. Thesis
Petrus Jozef Demaayer 1974 246 p
Avail: Univ. Microfilms Order No. 75-2222

The electrical and optical properties of thin films of TiN sub x and TiC sub x were studied as a function of composition

and substrate temperature of deposition. The properties of these high-melting, metallically conductive compounds are closely related to band structure. Even at stoichiometry, TiN exhibits a large concentration of vacant lattice sites, as a more stable compound was obtained by emptying the antibonding orbitals. Thin films of both were prepared by electron beam evaporation, and the composition of the samples was changed by respectively introducing N2 in the system and adding carbon to the starting batch. The electrical resistivity was found to increase with deviations from stoichiometry for both compounds due to the increased scattering of the conduction electrons by the vacancies. The number of conduction electrons was increased of TiC sub x with decreasing metalloid content, but the opposite behavior was observed for TiN. The optical properties of the films depend strongly on the defect structure; the reflectivity and optical constants were all found to decrease with deviations from the stoichiometric composition for TiN sub x. The optical properties of TiC sub x films were nearly independent on composite and substrate temperature. Dissert. Abstr.

N75-22147 Cincinnati Univ., Ohio.
PHOTOCURRENT STORAGE IN Na-DOPED CdS Ph.D. Thesis
Benjamin C. Hubbard 1974 162 p
Avail: Univ. Microfilms Order No. 75-3348

Thermal conductivity vs. temperature for a sample in the photo-stimulated storage state was found to be virtually unchanged from an unexcited, dark run with the same sample. For the temperature range of 80 - 230 K, storage state Hall mobilities were low (2 - 25 sq cm/V-sec) and showed a definite activation character for all levels of initial photoexcitation. Measured activation energies ranged from 0.019 eV to 0.046 eV. Independent of the density of photoexcited carriers, Hall mobilities at the conductivity maxima for all runs were observed to be the same and equal to 17 sq cm/V-sec. For current parallel to the C-symmetry axis of the crystal, no significant change in conductivity activation energies was observed. However, for thermally stimulated current runs with stress applied a sharp discontinuous drop in stored conductivity was observed at 215 K and at 222 K. Dissert. Abstr.

N75-22148 Pennsylvania Univ., Philadelphia.
MICROWAVE STUDIES OF THE METALLIC STATE AND METAL-INSULATOR TRANSITION IN THE ONE-DIMENSIONAL ORGANIC CONDUCTOR (TTF)(TCNQ) Ph.D. Thesis
Satish Kumar Khanna 1974 189 p
Avail: Univ. Microfilms Order No. 75-2746

Experimental studies are presented of the microwave properties of pure crystals of the organic charge transfer salt tetrathio fulvalene tetracyano quinodimethan ((TTF)(TCNQ)). The molecule tetracyano quinodimethan (TCNQ) has a very high electron affinity and forms charge transfer salts with virtually any electron donor, and in the case of (TTF)(TCNQ), this results in an unparied electron the TCNQ(-) and an unpaired hole on the donor cation (TTF). The planar molecules TTF and TCNQ crystallize in segregated linear stacks with molecules within a stack set face to face. The salt (TTF)(TCNQ) exhibits the highest electrical conductivity of any known organic system at room temperature. Above 60 K, (TTF)(TCNQ) is a strongly coupled electron-phonon one dimensional metal in which electron-electron coulomb interaction play a minor role. Near 60 K, it undergoes a metal-insulator transition to a nonmagnetic semiconducting state. A cavity perturbation technique was used to measure the microwave ac conductivity and dielectric constant, in which one places the crystal in the cavity along the maximum E-field and observes the shift in cavity frequency and the change in half-width. The skin-depth (surface impedance) formalism for the microwave properties is derived. Dissert. Abstr.

N75-22149 Minnesota Univ., Minneapolis.
NUCLEATION AND GROWTH OF SPUTTERED THIN FILMS Ph.D. Thesis
Jer-Shen Maa 1974 176 p
Avail: Univ. Microfilms Order No. 75-2124

The nucleation and growth of sputtered thin films were studied using the in-situ electron microscope technique. Thin metal films were deposited by ion beam sputtering on single crystal substrates of mica, graphite and silicon inside an electron microscope. Silver nuclei (20 A - 100 A) deposited on graphite substrates were found to be mobile. Some nuclei can migrate on the substrate to a distance of several hundred angstroms. The nucleation and growth of silver on muscovite mica were controlled by substrate surface defects. Silver nuclei were locked on the defect sites and were not mobile. In the case of silver on silicon, a two-layer growth process was observed. Neither nucleus mobility nor liquid-like coalescence was observed during the growth of the first layer islands. The dependence of saturation island density on substrate temperature and deposition rate followed the prediction of Stowell-Hutchinson theory for silver on mica and silicon, but not for silver on graphite. Dissert. Abstr.

N75-22150 Florida Univ., Gainesville.
ELECTROMIGRATION IN ALUMINUM, GOLD AND SILVER THIN FILMS Ph.D. Thesis
Hans Joachim Geier 1974 100 p
Avail: Univ. Microfilms Order No. 75-3491

The activation energy (Q) for electrotransport in thin aluminum, silver, and gold films was measured by a resistometric technique involving several individual resistance measurements along a stripe. The activation energy for electrotransport in thin aluminum films was found to be temperature dependent and to vary continuously between 0.45 eV and 0.72 eV in a temperature range between 220 C and 360 C. For silver films, two distinct temperature regions with different activation energies were found. Between 225 C and 280 C, Q is 0.95 eV which suggests predominance of ion movement in the grain boundaries; whereas at temperatures between 160 C and 225 C, Q is 0.3 eV which suggests surface dominated electrotransport. In gold films, a uniform activation energy of 0.98 eV was found in the entire temperature range (260 C-380 C). Experimental results on the controversial issue upon the direction of electrotransport in gold films are presented. Dissert. Abstr.

N75-22151 Cornell Univ., Ithaca, N.Y.
STUDIES OF OPTICAL EXCITATIONS IN THIN SOLID FILMS BY ELECTRON SCATTERING Ph.D. Thesis
Cheng-Hsuan Chen 1974 187 p
Avail: Univ. Microfilms Order No. 75-4245

Characteristic electron energy-loss processes in thin solid films, including semiconductors (Si, Ge and III-V compounds), layer-type crystals (graphite, transition metal dichalcogenides), and an insulator (amorphous aluminum oxide), were examined for scattering angles less than .00025 rad. The relatively high energy of the electron beam (75 keV), combined with a low angular divergence allows the identification of retardation effects in both volume and surface excitations. The experimental observations were possible using a Wien electron spectrometer mounted underneath an electron microscope. Various solid state excitations in these thin solid films are found to play a very significant role in the optical properties of solids. In semiconductor films, bulk and surface plasmons and Cherenkov radiation are the prominent excitations. Dissert. Abstr.

N75-22152 Texas Univ., Austin.
ELECTRON-NONHOMOGENEOUS MAGNETIZATION INTERACTION IN THIN FILMS OF CADMIUM CHROMIUM SELENIDE Ph.D. Thesis
Anthanasios J. Syllaios 1974 83 p
Avail: Univ. Microfilms Order No. 75-4461

The equations of motion for the electron spin and trajectory are solved in an inhomogeneous magnetic field, such as a magnetic domain wall or a periodic magnetic structure in a ferromagnetic semiconductor. It is found that the electron spin polarization is conserved only for electrons traveling through a magnetization reversal in a time shorter than the Larmor precession period of the spin around the magnetization vector. There are two different kinds of trajectories. For electron velocities and electric fields smaller than a critical value, the trajectory is cycloidal. When the critical value is exceeded, the trajectory is modified drastically. When scattering is introduced the anomalous Hall angle and mobility will be modified by the presence of magnetization inhomogeneities. If the local magnetic inhomogeneities form a periodic structure, a new parameter of length dimension, the period of the structure, modifies the electron energy bands. Dissert. Abstr.

N75-22153 North Carolina Univ., Chapel Hill.
THE TOMASCH EFFECT IN EPITAXIAL LEAD FILMS BACKED BY SILVER Ph.D. Thesis
Timothy Wesley Haywood 1974 136 p
Avail: Univ. Microfilms Order No. 75-4826

An elementary picture of the interacting superconductor quasiparticles is given followed by a synopsis of the several theories of the Tomasch effect and a discussion of its measurements. A procedure for the growth of epitaxial Pb films and the subsequent fabrication of tunnel junctions of these films is given. It is shown that a theory by T. Wolfram most nearly fits the experimental observations of the study. This theory is then used to indirectly obtain a value for the perturbation in the energy gap at the Pb-Ag interface. A technique is developed for unfolding multiple-oscillation Tomasch data and is used to obtain values for the Fermi velocity in Pb for several specific points on the Fermi surface. Dissert. Abstr.

N75-22154 Virginia Univ., Charlottesville.
MAGNETIC SUSCEPTIBILITY MEASUREMENTS USING SUPERCONDUCTING DEVICES Ph.D. Thesis
Edward John Cukauskas 1974 106 p
Avail: Univ. Microfilms Order No. 75-2040

The design, performance, and noise analysis of a prototype superconducting susceptometer are discussed, incorporating a Josephson junction magnetometer, superconducting persistent current magnet, and superconducting shields. Changes in susceptibility cgs can be detected with a 1 sec. system response time. The sensitivity is limited at this value by Johnson noise and thermally induced fluctuations in the nuclear paramagnetism in the copper construction material used in the low temperature environment. By using a known source of flux in the form of a long solenoidal coil, an independent calibration of the system was achieved in agreement with a secondary calibration using a paramagnetic salt. A number of measurements including nuclear magnetic resonance, static susceptibility and susceptibility as a function of temperature were demonstrated with the system. Dissert. Abstr.

N75-22155 State Univ. of New York, Stony Brook.
EXCITATIONS AND RESPONSE IN CERTAIN SOLID STATE SYSTEMS Ph.D. Thesis
Mustansir Abula Barma 1974 148 p
Avail: Univ. Microfilms Order No. 75-5375

The method of double time Green's functions is used to study the excitation spectrum of an isotropic spin one system with quadrupolar coupling. It is shown that the random phase approximation leads to the violation of a spin one identity and thus to equivocal results. A consistent theory free from ambiguity is developed. Also, exact upper and lower bounds on the ground state energy of systems with dipolar as well as quadrupolar coupling are derived and studied. Data are also given on the coupling of a narrow band of electrons to lattice vibrations in terms of the modulation of the one-electron transfer integrals due to phonons. The electrical conductivity due to phonon-assisted processes is calculated for the Mott insulator. These processes modify the temperature dependence of the conductivity and introduce lifetimes related to the phonon density-of-states. The magnetic susceptibility is calculated at high temperatures and it is seen that the effects of phonons can be described in terms of a reduced Curie constant and an enhanced Curie-Weiss temperature. Dissert. Abstr.

N75-22156 Michigan State Univ., East Lansing.
THERMOPOWER OF METALS IN HIGH MAGNETIC FIELDS Ph.D. Thesis
Chwan-Kang Chiang 1974 195 p
Avail: Univ. Microfilms Order No. 75-7139

The thermopower of polycrystalline copper, silver, gold, aluminum, indium and lead was measured from liquid helium temperature to 100 K in magnetic fields up to 50 kG. Large enhancement of thermopower by the magnetic field was found, and a peak in the temperature dependence of delta S(H,T) was observed for the first time. The field results in a large enhancement of the phonon-drag thermopower in contrast to early expectation of MacDonald and Pearson. Two theoretical models were developed to explain the observed effects. The electron-diffusion model relies on the well-known Mott formula for the diffusion-thermopower, and Wiedemann-Franz law. The phonon-drag model is based on the semiclassical electron dynamics in a magnetic field, and also a concept from Pippard. It is found that these two models together can give a good explanation of the experimental results. Dissert. Abstr.

N75-22157*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
PROCESSOR ARCHITECTURES UTILIZING MAGNETIC BUBBLE AND SEMI-CONDUCTOR MEMORIES Interim Report
E. A. Parrish, Jr. and J. H. Aylor Apr. 1975 63 p
(Grant NsG-1067)
(NASA-CR-142673; EE-4027-102-75) Avail: NTIS HC $4.25 CSCL 20L

To aid work being conducted on the feasibility of a low cost Omega navigational receiver, a control panel was designed and constructed according to supplied specifications. Since the proposed Omega receiver is designed around a microprocessor, software engineering necessary for control panel operation is included in the design. The control panel is to be used as an operational model for use in the design of a prototype receiver. A detailed description of the hardware design is presented along with a description of the software needed to operate the panel. A complete description of the operating procedures for the panel are also included. Author

N75-22158*# Alabama Univ., Huntsville. Dept. of Physics.
EVALUATION OF SEMICONDUCTOR SPECIMENS BY X-RAY ANALYSIS Final Report
H. U. Walter Mar. 1975 38 p refs
(Contract NAS8-29650)
(NASA-CR-120729) Avail: NTIS HC $3.75 CSCL 20L

Germanium and GaAs crystals were investigated for studies on photovoltaic effects, chemical etching and epitaxial growth according to the overall objective to assess the defect structure of single crystalline materials. A brief survey of basic theory and topographical techniques is provided; examples of topographs are presented. Author

N75-22159# Sandia Labs., Albuquerque, N.Mex.
PRESSURE DEPENDENCE OF THE RARE EARTH KNIGHT SHIFT IN THE SINGLET GROUND STATE SYSTEMS PrP AND TmP
H. T. Weaver and J. E. Schirber 1974 12 p refs Presented at 20th Ann. Conf. on Magnetism and Magnetic Materials, San Francisco, 3 Dec. 1974 Sponsored by ERDA
(SAND-74-5579; Conf-741202-10) Avail: NTIS HC $3.25

The pressure dependence of the Knight shift (K) was measured for Pr-141 in PrP and Tm-169 in TmP at 4 K and find d ln K/dP = 0.83% and 0.48%/kbar, respectively. Both compounds are paramagnetic but exhibit a temperature independent susceptibility near T = 0 due to crystal field induced singlet electronic ground state. The rare earth Knight shift provides a direct measurement of the susceptibility, from which the crystal field splitting may be determined. Thus, the result of d ln K/dP > 0 is in qualitative disagreement with the usually successful effective point charge model. Such a model implies that field splitting varies as some inverse power of the lattice constant and, consequently, that the pressure derivative d ln K/dP) is negative. Anomalous conduction electron nuclear coupling effects were checked by measuring the pressure dependence of the P-31 Knight shift in PrP. Author (NSA)

N75-22160# Sandia Labs., Albuquerque, N.Mex.
PRESSURE DEPENDENCE OF THE MAGNETIC ORDERING TEMPERATURES IN Cr-Fe ALLOYS
L. R. Edwards and I. J. Fritz 1974 14 p refs Presented at 20th Ann. Conf. on Magnetism and Magnetic Mater., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(SAND-74-5555; Conf-741202-4) Avail: NTIS HC $3.25

The pressure dependences of the magnetic transition temperatures of Cr-2.5 and 2.8 at.% Fe single crystal alloys were determined by electrical resistance and ultrasonic measurements. The results show that the 1 bar triple point (P,I,C) in the temperature concentration plane occurs at a concentration of approximately 2.5 at.% Fe in contrast to the previously published value of 4 at.% Fe. The high pressure data showed an abrupt

change in the pressure dependence of the I-C transition at 3.3 kbar, from which it is speculated that an additional magnetic phase exists. Author (NSA)

N75-22161# Brookhaven National Lab., Upton, N.Y.
DIFFUSION MECHANISMS FOR THE GROWTH OF Nb3Sn INTERMETALLIC LAYERS
H. H. Farrell, G. H. Gilmer, and M. Suenaga 1974 30 p refs Presented at the Intern. Conf. on Low Temp. Diffusion, Yorktown Heights, N. Y., 12 Aug. 1974 Sponsored by ERDA
(BNL-19166; Conf-740827-2) Avail: NTIS HC $3.75

The effects of increasing the Sn concentration in niobium bronze were studied. It was found that simple grain boundary diffusion should lead to compound formation with a parabolic time dependence. However, when other factors enter in, such as grain growth, reduction in chemical potential or any other factor that reduces the flux to the growth interface, the time dependence can fall. Conversely, when factors such as interface kinetics become dominant either through crack formation or a suppression of the grain size, the growth rate may exceed a parabolic time dependence and actually approach a linear time dependence under optimal circumstances. The layer of Nb3Sn at a Nb-(Cu-Sn) interface has proven to be a versatile system in that it can be made to display a variety of growth mechanisms by minor modifications of the Sn concentration in the bronze or by doping the starting material. Author (NSA)

N75-22162# California Univ., Berkeley. Lawrence Berkeley Lab.
STUDY OF ELECTRON CURRENT INTENSITIES EMITTED FROM THE SUPERLATTICE PLANES OF AN ORDERED ALLOY M.S. Thesis
J. Lira-Olivares May 1974 235 p refs
(Contract W-7405-eng-48)
(LBL-2265) Avail: NTIS HC $7.50

The electron emission from cold, NI4W specimens was studied using a field ion-field emission microscope and a Jarrell-Ash recording microphotometer. Small current variations were observed on azimuthal intensity measurements on the alpha phase. These were interpreted as produced by different densities of solute at the surface of the emitter. The electron current emitted from the layered superlattice planes of the beta phase showed cyclical changes in intensity produced by the removal of atomic monolayers using field evaporation. Such a variation was interpreted by comparing the field evaporation process of the layered superlattice planes with the adsorption of epitaxial layers on a metal substrate. A model was suggested for the interpretation of the current variation observed. The observation of the gamma phase of NI4W is reported as well as a variation of the standard field ion microscopy method for the observation of surface defects. Author (NSA)

N75-22163# California Univ., Livermore. Lawrence Livermore Lab.
CRACKED TWO-DIMENSIONAL SYSTEMS
R. C. Cook 31 Oct. 1974 19 p refs
(Contract W-7405-eng-48)
(UCRL-51655) Avail: NTIS HC $3.25

The computer code CRACK calculates the free energy and the energy and displacement fields of a two-dimensional, triangular lattice connected by nearest-neighbor Hookean springs. Certain of the bonds may be broken to approximate a crack, and an external force can be applied to the boundaries parallel to the crack. Author (NSA)

N75-22164# Sandia Labs., Albuquerque, N.Mex.
STUDY OF STRUCTURAL PHASE TRANSITIONS AT HIGH PRESSURE: SOFT MODES IN FERROELECTRICS AND DIELECTRICS
G. A. Samara 1974 14 p refs Presented at the 4th Intern. Conf. on High Pressure, Kyoto, 25 Nov. 1974 Sponsored by ERDA
(SAND-74-5819; Conf-741116-1) Avail: NTIS HC $3.25

Conditions for lattice stability and the soft phonon mode concept are discussed briefly. The decrease in the frequency of the soft mode as the transition is approached is caused by the cancellation between competing forces. Pressure can strongly modify the balance between these forces and thereby influence or even induce soft mode behavior. Examples are given to illustrate a number of different facets of the general soft mode problem and the usefulness of pressure as a variable for investigating soft mode behavior. These examples include phase transitions in perovskites, hydrogen-bonded ferroelectrics of the KH2PO4-type, and paratellurite (TEO2). The transitions involve either soft optic or soft acoustic modes. Author (NSA)

N75-22165# Sandia Labs., Albuquerque, N.Mex.
SOLID STATE SURFACE ANALYSIS BY ION BACKSCATTERING AND CHANNELING
S. T. Picraux 1974 21 p refs Presented at the 3d Conf. on the Use of Small accelerators, Denton, Texas, 21 Oct. 1974 Sponsored by ERDA
(SAND-74-5425; Conf-741040-7) Avail: NTIS HC $3.25

Examples of the applications of ion backscattering to anodization studies and to resistor films for microelectronics circuits are given. Depth profiling is demonstrated for applications to dopant diffusion and to metal contact reactions with semiconductors. By combining ion channeling together with backscattering measurements, crystallographic information such as the degree of crystal disorder and the lattice location of impurities can be obtained. Examples are given of studies of heteroepitaxial layer quality and of implanted impurity atom location. Author (NSA)

N75-22166# Chicago Univ., Ill.
[VIBRATIONAL AND ELECTRONIC PROPERTIES OF AMORPHOUS AND CRYSTALLINE SOLIDS, INCLUDING GASEOUS AND LIQUID COUNTERPARTS] Technical Progress Report, 1 Sep. 1973 - 31 Aug. 1974
1974 7 p refs
(Contract AT(11-1)-2126)
(COO-2126-18) Avail: NTIS HC $3.25

Vibrational and electronic properties were studied using Raman spectroscopy, infrared spectroscopy, optical mixing, and high pressure uniaxial stress techniques. Included are data on GeAs, GeGa, Ge, arsenic sulfides, arsenic oxides, SiC, BN, and carbon. NSA

N75-22167# Atomic Energy of Canada Ltd., Chalk River (Ontario).
[REASEARCH PROGRESS IN SOLID STATE, GENERAL AND PHYSICAL CHEMISTRY, AND MATERIALS SCIENCE] Progress Report, 1 Apr. 1974 - 30 Jun. 1974
Jul. 1974 122 p
(AECL-4843) Avail: ERDA Depository Libraries HC $5.25

Research is reported in the areas of solid state science, general chemistry, physical chemistry, and materials. Lists of publications reporting this work are included. Topics discussed include ion penetration, electron microscopy, radiation damage, nuclear chemistry, electrochemistry, mass spectrometry, deuterium analysis, hydrogen-water exchange, radiation chemistry, surface chemistry, precipitation hardening, isotopes, field emissions, and electrolytic hydrogen-deuterium separation. M.J.S.

N75-22168# Pennsylvania Univ., Philadelphia. Dept. of Physics.
DYNAMICS AND STATISTICAL MECHANICS OF A ONE DIMENSIONAL MODEL HAMILTONIAN FOR STRUCTURAL PHASE TRANSITIONS
J. A. Krumhansl and J. R. Schrieffer Oct. 1974 34 p refs
(Contract AT(11-1)-3161)
(COO-3161-27) Avail: NTIS HC $3.75

The thermodynamic and dynamic properties of a one-dimensional model system whose displacement field Hamiltonian is strongly anharmonic and is representative of those used for displacive phase transitions were studied. Important solutions (domain walls) that cannot be represented effectively by the usual phonon perturbation expansions were studied by applying the classical equations of motion. The thermodynamic properties of this system can be calculated exactly by functional integral methods. At low temperature, the thermodynamic behavior agrees with that found from a phenomenological model in which both phonons and domain walls are included as elementary excitations. It is shown that equal time correlation functions calculated by both functional integral and phenomenological methods agree, and that the dynamic correlation functions (calculated only

phenomenologically) exhibit a spectrum with both phonon peaks and a central peak due to domain wall motion. Author (NSA)

N75-22169# Arizona Univ., Tucson. Dept. of Chemistry.
POLYMERIC THERMISTORS Technical Progress Report, 1 Jan. - 31 Aug. 1974
Henry Freiser 4 Oct. 1974 17 p refs
(Contract N00014-67-A-0209-0017)
(AD-A001014; TR-3) Avail: NTIS CSCL 20/12

Conductance studies at various temperatures and pressures have been carried out on polymeric films of PVC and epoxy containing quaternary ammonium chlorides and selected plasticizers. In addition, dielectric constants measurements have been made on these materials. The work is discussed in terms of its bearing on the mechanism of electric conduction in filled polymeric films. Author (GRA)

N75-22170# Defence Research Establishment Ottawa (Ontario).
THE LINEAR STARK EFFECT IN RUBY
Arthur W. Johnson Oct. 1974 24 p refs
(AD-A002768; DREO-R-706) Avail: NTIS CSCL 20/12

The ERP lineshifts occurring in ruby when stressed with dc, modulated dc and ac fields are described. It is shown that the space charge effects which might influence the dc results can be overcome by modulating the stressing voltage. The lineshift sensitivity obtained agrees well with published values; however, ac line broadening measurements yield figures which differ from the dc shifts by an unexplained factor of two. Computer-generated curves are presented to illustrate the mechanisms of line broadening. GRA

N75-22171# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
STUDY OF BASIC PARAMETERS AND TECHNOLOGY IN LEAD SALTS TO IMPROVE DEVICE PERFORMANCE Final Technical Report
Clifton G. Fonstad Dec. 1974 28 p refs
(Contract N00014-67-A-0204-0010)
(AD-A003013; Solid-State-Device-TR-12) Avail: NTIS CSCL 20/12

All of the major results of this research have now appeared in the open literature. The definitive works on diffusion in the Pb-salts and on high field transport have been done under this contract. A new crystal growth technique for the lead-tin chalcogenides has also been developed. In this final technical report the publications, papers, these and reports produced under this contract and the personnel associated with it and degrees granted to students as a result of it are presented. GRA

N75-22172# Notre Dame Univ., Ind. Dept. of Metallurgical Engineering and Materials Science.
MAGNETIZATION, MAGNETOCRYSTALLINE ANISOTROPY AND MAGNETOSTRICTION IN SOME RARE-EARTH-COBALT COMPOUNDS, R2Co17
A. E. Miller Dec. 1974 46 p refs
(Contract N00014-67-A-0242-0007; NR Proj. 039-113)
(AD-A003014; TR-12-74) Avail: NTIS CSCL 20/12

The magnetocrystalline anisotropy and magnetostriction behavior of the rare-earth-cobalt intermetallics Lu sub x Tm sub (2-x) Co17 and V sub x Dy sub (2-x) Co17 (x = 0,2/3, 4/3,2) was determined from measurements performed on large single crystals. Magnetization measurements were performed with a vibrating sample magnetometer, and the magnetostriction was measured by standard strain gage techniques. Measurements were made from 77 K to 500 K in magnetic fields to 12,000 Oe. GRA

N75-22173# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IRREVERSIBLE CHANGES IN PROPERTIES OF PHOSPHOR CRYSTALS RESULTING FROM EXPLOSIVE EFFECT
A. I. Lapshin and T. P. Lazarenko 18 Nov. 1974 15 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 533-539
(AD-A002916; FTD-HT-23-1984-74) Avail: NTIS CSCL 20/12

Crystals containing doses of impurity and structural defects are reported. The explosive action on complex organic dyes absorbed on SiO2 is discussed. Static experiments have shown that local centers and the main substrate reveal a different behavior under compression. M.C.F.

N75-22174# California Univ., La Jolla. Dept. of Physics.
GREEN'S FUNCTION METHOD FOR CRYSTAL FILMS AND SURFACES
Walter Kohn Dec. 1974 19 p refs
(Contract N00014-69-A-0200-6026)
(AD-A002999; TR-26) Avail: NTIS CSCL 20/12

The Green's function (or KKR) method is adapted to the problem of an electron moving in a crystal film. The potential is taken as spherical in the atomic spheres and as dependent only on the coordinate normal to the film in the regions just outside the bounding atom planes. The appropriate new structure constants are defined. With the aid of the necessary logarithmic derivatives a rather small set of simultaneous linear equations is obtained from which eigenvalues and eigenfunctions can be calculated. In conjunction with the density functional formalism this procedure provides a convenient method for self-consistently calculating the electronic structure of films and surfaces. GRA

N75-22175# Intelcom Rad Tech, San Diego, Calif.
STUDY OF THE EFFECTS OF RADIATION ON THE ELECTRICAL AND OPTICAL PROPERTIES OF HgCdTe
Charles E. Mallon, Barry A. Green, Roland E. Leadon, and James A. Naber 30 Jun. 1974 88 p refs
(Contract F19628-72-C-0311; AF Proj. 5621; DNA Proj. NWED-QAXT-A026)
(AD-A003390; INTEL-RT-8027-008; SR-3; AFCRL-TR-74-0313) Avail: NTIS CSCL 20/12

This report discusses the results of experimental and theoretical investigation of the effects of irradiation (electron, neutron, and gamma) on the electrical and optical properties of the alloy semiconductor HgCdTe. The effects of radiation on the electrical and optical properties are of major interest in this program, since this data can then be used to predict radiation response of devices fabricated from HgCdTe. These results include measurements of the carrier concentration, Hall mobility, carrier lifetime, photoconductive spectral response, and optical transmission before irradiation, as a function of irradiation fluence, and as a function of anneal temperature. Theoretical analysis and models are presented to explain irradiation-produced changes. GRA

N75-22176# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INFLUENCE OF ELECTRON (1.5 MEV) AND PROTON (5 MEV) IRRADIATION ON ELECTRICAL, OPTICAL, AND PHOTOELECTRIC CHARACTERISTICS OF GALLIUM ARSENIDE
M. A. Krivov and V. N. Brudnyi 18 Nov. 1974 11 p refs Transl. into ENGLISH from Radiats. Fiz. Nemetallicheskikh Kristallov Sbornik Statei (USSR), v. 3, 1971 p 16-21
(AD-A002814; FTD-HT-23-0037-75) Avail: NTIS CSCL 20/12

The purpose of the present work is the study of the spectrum of radiation defects created by electrons (1.5 MeV) and protons (5 MeV) at temperatures close to 300K, their stability to annealing, and also the influence of an admixture of copper on the spectrum of the levels which develop after irradiation. For the investigation the authors used gallium arsenide of the n- and p-types of conductivity with a carrier concentration of 5 times ten to the 15th power to ten to the 18th power/cc. GRA

N75-22177# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SHOCK WAVES IN MEDIUMS WITH PHASE TRANSITIONS
S. M. Bakhrakh, V. N. Zubarev, and A. A. Shanin 19 Nov. 1974 15 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" Moscow, 1972 p 554-560
(AD-A003079; FTD-HT-23-1988-74) Avail: NTIS CSCL 20/12

Phase transitions in substances subjected to dynamic effects are theoretically investigated. A mathematical model which describes the motion of shock waves in a medium with phase

transitions is formulated along with an algorithm to solve the model. Numerical values of the parameters of the phase transitions are found by comparing the results of calculations with experimental data. J.M.S.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N75-22178*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTALLY-DETERMINED EXTERNAL HEAT LOSS OF AUTOMOTIVE GAS TURBINE ENGINE
Phillip R. Meng and Richard F. Wulf Apr. 1975 36 p
(NASA-TM-X-71709; E-8318) Avail: NTIS HC $3.75 CSCL 21E

An external heat balance was conducted on a 150 HP two-shaft automotive gas turbine engine. The engine was enclosed in a calorimeter box and the temperature change of cooling air passing through the box was measured. Cooling airflow ranges of 1.6 to 2.1 lb-per-second and 0.8 to 1.1 lb-per-second were used. The engine housing heat loss increased as the cooling airflow through the calorimeter box was increased, as would be the case in a moving automobile. The heat balance between the total energy input and the sum of shaft power output and various losses compared within 30 percent at engine idle speeds and within 7 percent at full power. Author

N75-22179*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FILM BOILING OF MERCURY DROPLETS
Kenneth J. Baumeister, Glen J. Schoessow (Fla. Univ., Gainesville), and Charles E. Chmielewski (Fla. Light and Power Co., Miami) 1975 11 p refs Proposed for presentation at Natl. Heat Transfer Conf., San Francisco, Calif., 11-13 Aug. 1975
(NASA-TM-X-71702; E-8310) Avail: NTIS HC $3.25 CSCL 20M

Vaporization times of mercury droplets in Leidenfrost film boiling on a flat horizontal plate are measured in an air atmosphere. Extreme care was used to prevent large amplitude droplet vibrations and surface wetting; therefore, these data can be compared to film boiling theory. Diffusion from the upper surface of the drop appears as a dominant mode of mass transfer from the drop. A closed-form analytical film boiling theory is developed to account for the diffusive evaporation. Reasonable agreement between data and theory is seen. Author

N75-22180# Stanford Research Inst., Menlo Park, Calif.
TIGER COMPUTER PROGRAM DOCUMENTATION
M. Cowperthwaite and W. H. Zwisler Mar. 1974 104 p refs
(Contracts AT(04-3)-115; N60921-72-C-0013; Contract DAAA21-71-C-0454; SRI Proj. PYU-1281; SRI Proj. PYU-1397)
(AD-A002791) Avail: NTIS CSCL 07/4

TIGER is a digital computer program written in FORTRAN IV for calculating the thermodynamic state attained in a heterogeneous system of known atomic composition containing gases, liquids, and solids with arbitrary equations of state. This volume contains the theoretical basis of the TIGER code and its application to the calculation of the properties of detonating condensed explosives. The equations used by Brinkley to calculate the thermodynamic state in a nonideal heterogeneous system of known atomic composition in chemical equilibrium are derived and extended to treat such systems in partial equilibrium. A brief discussion of the Chapman-Jouget (CJ) theory of detonation is followed by an account of the methods used to compute conditions in the CJ wave and the properties of the detonation products along Hugoniot curves and isentropes. The presentation in this volume will be of interest primarily to the reader concerned with understanding the theoretical background of the code rather than to the user of the program. GRA

N75-22181# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINING ISENTROPES OF EXPANSION IN SUBSTANCES AFTER SHOCK COMPRESSION
M. V. Zhernokletov and V. N. Zubarev 18 Nov. 1974 11 p refs Transl. into ENGLISH from Gorenie i Vzryv (Moscow), 1972 p 565-568
(AD-A003094; FTD-HT-23-1990-74) Avail: NTIS CSCL 07/4

The results of measurements and calculations are shown where a comparison is given between the dynamic adiabats and the isentropes obtained for teflon (A), paraffin (B) and ice (C). The isentropes and shock adiabats correspond within significant pressure intervals. Significant divergence is observed only at low pressures. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-22182*# Washington Univ., St. Louis, Mo.
LARGE-SCALE EDUCATIONAL TELECOMMUNICATIONS SYSTEMS FOR THE US: AN ANALYSIS OF EDUCATIONAL NEEDS AND TECHNOLOGICAL OPPORTUNITIES
Robert P. Morgan, Jai P. Singh, Donna Rothenberg, and Burke E. Robinson Apr. 1975 426 p refs
(Grants NGR-26-008-054; NSF EC-38871)
(NASA-CR-142619; CG-75/1) Avail: NTIS HC $11.25 CSCL 05I

The needs to be served, the subsectors in which the system might be used, the technology employed, and the prospects for future utilization of an educational telecommunications delivery system are described and analyzed. Educational subsectors are analyzed with emphasis on the current status and trends within each subsector. Issues which affect future development, and prospects for future use of media, technology, and large-scale electronic delivery within each subsector are included. Information on technology utilization is presented. Educational telecommunications services are identified and grouped into categories: public television and radio, instructional television, computer aided instruction, computer resource sharing, and information resource sharing. Technology based services, their current utilization, and factors which affect future development are stressed. The role of communications satellites in providing these services is discussed. Efforts to analyze and estimate future utilization of large-scale educational telecommunications are summarized. Factors which affect future utilization are identified. Conclusions are presented. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-22183*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SAFETY MANAGEMENT OF A COMPLEX R AND D GROUND OPERATING SYSTEM
James F. Connors and Roy A. Maurer 1975 38 p refs Presented at Ann. Safety Symp. on the Eng. Aspects of Safety, Port Hueneme, Calif., 20 Feb. 1975; sponsored by Federal Occupational Safety and Health Council of Southern Calif.
(NASA-TM-X-71697; E-8301) Avail: NTIS HC $3.75 CSCL 05A

A perspective on safety program management was developed for a complex R&D operating system, such as the NASA-Lewis Research Center. Using a systems approach, hazardous operations are subjected to third-party reviews by designated-area safety committees and are maintained under safety permit controls. To insure personnel alertness, emergency containment forces and employees are trained in dry-run emergency simulation exercises.

The keys to real safety effectiveness are top management support and visibility of residual risks. Author

N75-22184# California Univ., Berkeley. Lawrence Berkeley Lab.
LBL-MIS: A COMPUTER AIDED SYSTEM FOR MANAGEMENT OF RESEARCH
R. L. Hinckley, D. F. Kane, J. Kearney-Wright, P. W. Weber, and J. L. Zimmerman Sep. 1974 50 p refs
(Contract W-7405-eng-48)
(LBL-3089) Avail: NTIS HC $3.75

An experimental, computer-oriented management information system, LBL-MIS, currently under development is designed to aid the management primarily of the Physics Division, but potentially to aid other LBL divisions also. The historical background to this system is included. The approach taken was to integrate the many pieces of available machine-readable management data and to heuristically approach a general management system, using the high speed CRT display as a basic I/O device. NSA

N75-22185# Perceptronics, Inc., Woodland Hills, Calif.
ADAPTIVE COMPUTER AIDING IN DYNAMIC DECISION PROCESSES: AN INITIAL STUDY IN DYNAMIC UTILITY CONVERGENCE AND DECISION AIDING Semiannual Technical Report, 1 Apr. - 30 Sep. 1974
Richard L. Weisbrod, Kent B. Davis, Amos Freedy, and Gershon Weltman 29 Nov. 1974 59 p refs
(Contract N00014-73-C-0286; ARPA Order 2347; NR Proj. 196-128)
(AD-A003015; PTR-1016-74-11) Avail: NTIS CSCL 05/10

One central goal of the decision theory is to provide a rational basis for decision making. The ADDAM (Adaptive Dynamic Decision Aiding Mechanism) System is designed to aid the decision maker (DM) in performing dynamic decision tasks. The ADDAM system provides real-time dynamic assessments of multiple utilities as the DM performs a dynamic decision task. ADDAM continuously tracks the DM's decision responses and uses adaptive pattern classification techniques to learn his utilities for their outcomes. These Utilities are then used to provide decision aiding of various forms, including recommendation of maximum expected utility decisions. The results of an initial experiment to investigate the effectiveness of the adaptive decision modeling system and the DM's acceptance of the model as a normative basis for decision making are reported. GRA

N75-22186# Air Force Logistics Command, Wright-Patterson AFB, Ohio. Systems Requirements and Control Div.
LOGISTICS COMPOSITE MODEL USERS REFERENCE GUIDE UPDATE: 1970 - 1974 ENHANCEMENTS
William F. Drake, III Nov. 1974 165 p refs
(AD-A003211; AFLC/ADDR-74-1) Avail: NTIS CSCL 15/5

The Logistics Composite Model L-COM is a system of computer models written in SIMSCRIPT I.5 designed to apply simulation to studies concerning the Air Force Base Level functions. The original Logistics Composite Model Users' Reference Guide, AFLC Report 70-1, was published Jan 1970. It was placed in the Defense Documentation Center, Cameron Station, Virginia, under the assigned number AD-703328. In this update publication, recent extensive modifications that interface with the user are described in a similar format as that of the original publication. This publication assumes knowledge of, or access to the original L-COM Users' Reference Guide. One of the original input forms was extensively modified and a new form added to accept new data. Additional selectable reports and features were added. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-22187*# Martin Marietta Aerospace, Orlando, Fla.
REGISTER OF EXPERTS FOR INFORMATION ON MECHANICS OF STRUCTURAL FAILURE
James L. Carpenter, Jr. and William F. Stuhrke Jan. 1975 91 p
(Contract NAS3-17640)
(NASA-CR-134754; OR-13318) Avail: NTIS HC $4.75 CSCL 05B

This register is comprised of a list of approximately 300 experts from approximately 90 organizations who have published results of theoretical and/or experimental research related to six problem areas in the mechanics of structural failure: (1) life prediction for structural materials, (2) fracture toughness testing, (3) fracture mechanics analysis; (4) hydrogen embrittlement; (5) protective coatings; and (6) composite materials. The criteria for the selection of names for the register are recent contributions to the literature, participation in or support of relevant research programs, and referral by peers. Each author included is listed by organizational affiliation, address, and principal field of expertise. The purpose of the register is to present, in easy reference form, sources for dependable information regarding failure modes and mechanisms of aerospace structures. The register includes two indexes; an alphabetical listing of the experts and an alphabetical listing of the organizations with whom they are affiliated. Author

N75-22188# Oak Ridge National Lab., Tenn.
COMPUTER CODES AND DATA AVAILABLE FROM THE RADIATION SHIELDING INFORMATION CENTER
D. K. Trubey, B. F. Maskewitz, and R. W. Roussin Nov. 1974 5 p refs Presented at Intern. Symp. on Radiation Phys., Calcutta, India, 30 Nov. 1974 Sponsored by ERDA
(Conf-741109-2) Avail: NTIS

The Radiation Shielding Information Center is a technical institute serving the international shielding community. It acquires, selects, stores, retrieves, evaluates, analyzes, synthesizes, and disseminates information on shielding and ionizing radiation transport. The major activities include: (1) operating a computer-based information system and answering inquiries on radiation analysis, and (2) collecting, checking out, packaging, and distributing large computer codes, and evaluated and processed data libraries. The data packages include multigroup coupled neutron-gamma-ray cross sections and kerma coefficients, other nuclear data, and radiation transport benchmark problem results. Author (NSA)

N75-22189# Atomic Energy Research Establishment, Harwell (England).
PREPARATION OF INTERDISCIPLINARY CURRENT AWARENESS BULLETIN FROM SEVERAL TAPE SERVICES: PRELIMINARY STUDY
J. E. Terry and G. Olive Oct. 1974 15 p refs
(AERE-M-2656) Avail: ERDA Depository Libraries HC $4.00

A preliminary study was undertaken of the production of a current awareness bulletin in an interdisciplinary subject, corrosion, by computer selection from several tape services. The literature of the subject and the coverage of the tape services were examined. The references obtained by computer matching a profile for corrosion against titles in ten different tapes for six months were analyzed. Duplication between two of the services was studied as a function of time. The results of the preliminary study show that it would be expensive to produce a bulletin by such means, and the delay in notifying many of the references would be considerable. Author (NSA)

N75-22190# Naval Research Lab., Washington, D.C.
NRL PROGRESS REPORT, SEPTEMBER 1974
Sep. 1974 51 p refs
(PB-238508/6) Avail: NTIS HC $4.25 Also available from NTIS on subscription $40.00/year domestic, $50.00/year foreign CSCL 05B

Reports are presented on research and development projects along with articles on underwater sound and towed-line array calibration, test, and evaluation. Other topics discussed include acoustics, laser interferometry, voice communications, radar, metallurgy, glass fracture, nuclear physics, solid state physics, and patents. M.J.S.

N75-21956* Kanner (Leo) Associates, Redwood City, Calif.
GENERAL CHARACTERISTICS OF PRELIMINARY DATA PROCESSING IN THE COPERNICUS EXPERIMENT
K. Ziolkovski and K. Kossatski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 13-16 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 21-27 (For availability see N75-21952 13-59)
CSCL 05B

N75-21961* Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF INFORMATION-RETRIEVAL METHODS TO THE CLASSIFICATION OF PHYSICAL DATA
Z. N. Mamotko, S. K. Khorolskaya, and L. I. Shatrovskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 57-67 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 91-104 (For availability see N75-21952 13-59)
CSCL 05B

N75-21973* Kanner (Leo) Associates, Redwood City, Calif.
UP-TO-DATE STATE OF STORAGE TECHNIQUES USED FOR LARGE NUMERICAL DATA FILES
Vaclav Chlouba *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F16164) Apr. 1975 p 157-174 refs Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 233-253 (For availability see N75-21952 13-59)
CSCL 05B

N75-21974* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATED STORAGE AND RETRIEVAL OF DATA OBTAINED IN THE INTERKOSMOS PROJECT
K. Ziolkovski and V. Pakholski *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 175-179 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 257-265 (For availability see N75-21952 13-59)
CSCL 05B

N75-21975* Kanner (Leo) Associates, Redwood City, Calif.
MAIN PRINCIPLES USED FOR BUILDING UP A DATA BANK FOR THE LONG-TERM STORAGE AND RETRIEVAL OF SCIENTIFIC SPACE DATA
G. N. Zlotin, A. B. Bykov, L. V. Roy, and Yu. D. Khovanskiy *In its* Conf. of the Inform. Process. Sect. of Interkosmos (NASA-TT-F-16164) Apr. 1975 p 180-200 Transl. into ENGLISH from the book "Soveshchaniye Sektsii Obrabotka Informatsii (Sbornik Dokladov) Interkosmos" Acad. of Sci., Ger. Democratic Rep., 1974 p 266-295 (For availability see N75-21952 13-59)
CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-22191*# Mathematica, Inc., Princeton, N.J.
ECONOMIC ANALYSIS OF NEW SPACE TRANSPORTATION SYSTEMS: EXECUTIVE SUMMARY
31 May 1971 70 p refs
(Contract NASw-2081)
(NASA-CR-143705) Avail: NTIS HC $4.25 CSCL 14A

An economic analysis of alternative space transportation systems is presented. Results indicate that the expendable systems represent modest investments, but the recurring costs of operation would remain high. The space shuttle and tug system requires a substantial investment, but would substantially reduce the recurring costs of operation. Economic benefits and costs of the different systems are also analyzed. Findings are summarized.
J.M.S.

N75-22192*# Environmental Research Inst. of Michigan, Ann Arbor.
SOME ECONOMIC BENEFITS OF A SYNCHRONOUS EARTH OBSERVATORY SATELLITE Final Report, 30 Jun. - 30 Sep. 1974
R. K. Battacharyya (ECON, Inc.), J. S. Greenberg (ECON, Inc.), D. S. Lowe, and I. J. Sattinger Sep. 1974 145 p refs Prepared jointly with ECON, Inc.
(Contract NAS5-20021)
(NASA-CR-143636; ERIM-107400-3-F) Avail: NTIS HC $5.75 CSCL 22B

An analysis was made of the economic benefits which might be derived from reduced forecasting errors made possible by data obtained from a synchronous satellite system which can collect earth observation and meteorological data continuously and on demand. User costs directly associated with achieving benefits are included. In the analysis, benefits were evaluated which might be obtained as a result of improved thunderstorm forecasting, frost warning, and grain harvest forecasting capabilities. The anticipated system capabilities were used to arrive at realistic estimates of system performance on which to base the benefit analysis. Emphasis was placed on the benefits which result from system forecasting accuracies. Benefits from improved thunderstorm forecasts are indicated for the construction, air transportation, and agricultural industries. The effects of improved frost warning capability on the citrus crop are determined. The benefits from improved grain forecasting capability are evaluated in terms of both U.S. benefits resulting from domestic grain distribution and U.S. benefits from international grain distribution.
Author

N75-22193*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SOME ECONOMIC BENEFITS OF A SYNCHRONOUS EARTH OBSERVATORY SATELLITE Executive Summary, 30 Jun. - 30 Sep. 1974
D. S. Lowe, I. J. Sattinger, J. S. Greenberg (ECON, Inc.), and R. K. Bhattacharyya (ECON, Inc.) Sep. 1974 12 p refs Prepared jointly with ECON, Inc.
(Contract NAS5-20021)
(NASA-CR-143635; ERIM-107400-4-X) Avail: NTIS HC $3.25 CSCL 22B

For abstract, see N75-22192.

N75-22194# Commerce Dept., Washington, D.C. Office of Policy Development.
NATIONAL INTEREST ASPECTS OF THE PRIVATE INTERNATIONAL AIR CARRIER SYSTEM OF THE UNITED STATES Final Report
W. Stephen Piper Sep. 1974 26 p refs
(COM-74-51220/3) Avail: NTIS MF $2.25; SOD HC $0.70 CSCL 05C

The twenty-one privately-owned and operated American air carriers serving foreign destinations make significant contributions to the economic posture, commercial interests, and national security of the United States. These scheduled and supplemental carriers contribute $3 billion in gross balance of payments inflow annually through their foreign earnings and their reduction of the need for Americans to import international air transportation services. The U.S. international carriers promote foreign sales of American airframes and they provide marketing assistance and information to American firms conducting foreign operations. They promote travel by foreigners to the United States. They also constitute a major portion of the Civil Reserve Air Fleet available in a national emergency.
GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-22195# Committee on Science and Astronautics (U. S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1974 176 p Rept. together with additional

views to accompany H.R. 13998, 93d Congr., 2d Sess., 10 Apr. 1974
(H-Rept-93-983) Avail: US Capitol, House Document Room

The committee actions on the NASA appropriation requests for Fiscal Year 1975 are reported. Program authorizations discussed include: space shuttles, space flight operations, aeronautical research and technology, and construction of facilities. F.O.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-22196# Defence Scientific Information Service, Ottawa (Ontario).
DEFENCE APPLICATIONS OF RECENT DEVELOPMENTS IN INFORMATION SCIENCE AND TECHNOLOGY
A. C. Jones Mar. 1975 17 p refs Presented at 25th Symp. of the Defence Res. Board, Ottawa, 14 Nov. 1973
(DSIS-TN-75-2) Avail: NTIS HC $3.25

Potential applications of the results of research and development in information sciences are discussed. Other topics discussed include information systems, information retrieval, artificial intelligence, photomicrographs, data storage devices, military research, programmed instructions, and computer techniques. M.J.S.

N75-22197*# California Univ., Berkeley. Institute of Governmental Studies.
INTERACTIONS OF TECHNOLOGY AND SOCIETY: IMPACTS OF IMPROVED AIRTRANSPORT, A STUDY OF AIRPORTS AT THE GRASS ROOTS
Todd LaPorte, Stephen Rosenthal, Stuart Ross, Kai N. Lee, and Edith Levine Dec. 1974 395 p refs
(Grant NGR-05-003-471)
(NASA-CR-142693) Avail: NTIS HC $10.25 CSCL 05K

The relationship of technological development to economic, social and political change is discussed for air transportation. The results of a field study of the Ohio County Airport Program are reported, and the implications of a social assessment of technology are also discussed. F.O.S.

N75-22198# National Technical Information Service, Springfield, Va.
TECHNOLOGY TRANSFER: A BIBLIOGRAPHY WITH ABSTRACTS
Edward J. Lehmann Jul. 1974 158 p
(NTIS-WIN-74-057; COM-74-11194) Avail: NTIS HC $6.25 CSCL 05B

This bibliography contains 144 selected abstracts of research reports retrieved using the NTIS on-line search system - NTISearch. The cited reports cover research in technology transfer for the period 1972 to June 1974. Included are topics on Government policies, aid to developing countries, feasibility studies, and NASA aerospace technology transfer to areas such as medicine, urban planning, pollution abatement, and manufacturing techniques. Author

N75-22199# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 1: EXECUTIVE SUMMARY AND TECHNICAL REPORT Final Report
W. F. Hamilton Oct. 1974 117 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238877/5; EPA-460/3-74-020-A-Vol-1) Avail: NTIS HC $5.25 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Impacts of the use of electric cars in the Los Angeles region in 1980-2000 were projected for four-passenger subcompact electric cars using lead-acid and advanced batteries, with urban driving ranges of about 55 to 140 miles, respectively. Data from Los Angeles travel surveys shows that such cars could replace 17-74 percent of future Los Angeles autos with little sacrifice of urban driving. Adequate raw materials and night-time recharging power should be available for such use in the Los Angeles Region. The electric subcompacts would appear to be 20-60% more expensive overall than conventional subcompacts until battery development significantly reduces battery depreciation costs. This volume makes an overall review. GRA

N75-22200# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 2: TASK REPORTS ON ELECTRIC CAR CHARACTERIZATION AND BASELINE PROJECTIONS Final Report
W. F. Hamilton, J. C. Eisenhut, G. M. Houser, and A. R. Sjovold Oct. 1974 331 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238878/3; EPA-460/3-74-020-B) Avail: NTIS HC $9.50 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Volume 2 of a three volume report projects future characteristics of electric cars and of the Los Angeles region in which they would be used. It postulates electric vehicle performance requirements, projects area population by county and age group, studies Los Angeles freeway and transit networks for auto usage, and fuel consumption, forecasts employment and income for the South Coast Air Basin, and the payroll of businesses involved in production, distribution, and maintenance of automobiles and parts, and notes the energy available for electric car recharging and its basic sources. GRA

N75-22201# General Research Corp., Santa Barbara, Calif.
IMPACT OF FUTURE USE OF ELECTRIC CARS IN THE LOS ANGELES REGION. VOLUME 3: TASK REPORTS ON IMPACT AND USAGE ANALYSIS Final Report
W. F. Hamilton, J. A. Cattani, J. C. Eisenhut, F. J. Markovich, and J. R. Martinez Oct. 1974 447 p refs 3 Vol.
(Contract EPA-68-01-2103)
(PB-238879/1; EPA-460/3-74-020-C) Avail: NTIS HC $11.25 HC also available from NTIS $24.00/set of 3 reports as PB-238876-SET CSCL 13F

Volume 3 of a three volume report on possible impacts due to various levels of urban electric car use describes the DIFKIN computer model and linear rollback for analyzing future air quality in the South Coast Air Basin, forecasts stationary and vehicular pollutant emissions with and without electric cars, analyzes possible reductions of community noise from electric car use, projects life cycle costs of alternative electric cars in comparison with conventional cars as well as changes in employment and payroll in industry segments impacted by electric cars, and analyzes 1967 data to determine distributions of daily driving. GRA

N75-22202# Minnesota Univ., St. Paul. Water Resources Research Center.
ROLE OF THE SCIENTIST TECHNICIAN IN WATER POLICY DECISIONS AT THE COMMUNITY LEVEL: A STUDY IN PURPOSIVE COMMUNICATION
Roy E. Rickson Dec. 1974 43 p refs
(PB-238314/9; W75-02888; OWRT-B-067-MINN(1)) Avail: NTIS HC $3.75 CSCL 13B

The objective of the report is to increase understanding of how scientific knowledge may be most effectively applied to community problem solving. The report focused on how certain community characteristics affect public perspective of science and the role of the scientist in solving water resources problems, and, the degree of consensus between perspectives and local leaders about science and the role of the scientist in defining and solving water problems. GRA

N75-22203# Pacific Northwest Environmental Research Lab., Corvallis, Ore.
WATER RECYCLE/REUSE POSSIBILITIES: POWER PLANT BOILER AND COOLING SYSTEMS Final Report, Jun. 1973 - Aug. 1974
Guy R. Nelson Dec. 1974 59 p refs Sponsored by EPA

(PB-238794/2; EPA-660/2-74-089) Avail: NTIS HC $4.25 CSCL 13B

The methodology to evaluate, in economic terms, potential power plant boiler and cooling system water recycle/reuse programs is given. Drum type boiler systems and closed cycle cooling systems are used as the basis for the programs' water requirements. The evaluations take into account the variable plant characteristics such as makeup water quality, fuel type, thermal efficiency, capacity factor and fixed charge rate. The evaluation methodology is applicable to existing and proposed power plants, on an individual plant basis--and can be used to determine the overall economics of potential recycle/reuse programs. The report is the first of a series that addresses the water recycle/reuse potentials of typical power plant processes. GRA

N75-22204# Ford Motor Co., Dearborn, Mich. Transportation Research and Planning Office.
PARAMETER OPTIMIZATION STUDIES OF MAGNETIC SUSPENSIONS FOR HIGH SPEED GROUND TRANSPORTATION Final Report, Jun. 1973 - Apr. 1974
Robert H. Borcherts, L. C. Davis, C. C. Wan, A. U. Mohdulla, and John R. Reitz Apr. 1974 168 p refs
(Contract DOT-FR-10026)
(PB-238773/6; FRA-ORD/D-74-42) Avail: NTIS HC $6.25 CSCL 13F

The study investigates efficient, cost-effective methods of high speed ground transportation for intercity travel. Previous aspects of the program demonstrated the technical feasibility of two types of magnetic suspensions (the attractive-force, and the repulsive-force suspensions) for such applications, and developed a baseline design for a tracked magnetically levitated research vehicle. The attractive force suspension considers the development of a mathematical model which predicts the magnetic behavior of the magnet-rail system for high speed, and a parameter optimization of the magnet. The repulsive-force suspension examines various track geometries to see if the amount of aluminum in the track could be reduced without loss of performance. GRA

N75-22205# AiResearch Mfg. Co., Torrance, Calif.
DESIGN, DEVELOPMENT AND TEST OF A WAYSIDE POWER DISTRIBUTION AND COLLECTION SYSTEM FOR THE TRACKED LEVITATED RESEARCH VEHICLE Final Report, 1 Mar. 1971 - 5 Jun. 1973
J. O. Webster, H. Shapiro, C. Guenther, G. Kalman, and J. Clemence 15 Apr. 1974 344 p
(Contract DOT-FR-10002)
(PB-238910/4; AiResearch-73-9436; FRA-ORD/D-74-25) Avail: NTIS HC $9.50 CSCL 13F

This document presents test activity description and results of the wayside power distribution and collection system designed for the TLRV, a high-speed ground transportation vehicle. The system was assembled to prove the design concept and feasibility of transferring high-electrical power between rail and collector brushes at elevated speeds while subjected to prevailing environmental conditions. With minor modifications, the initial design conformed to specified requirements up to speeds in excess of 300 mph. Analysis of the rail configuration and test results indicated that distance between the wayside rail supports could be doubled (25 ft) lessening by half the number of supports required to maintain the rail's alignment integrity at design speeds. GRA

N75-22206# Battelle-Northwest, Richland, Wash.
FEASIBILITY STUDY OF USE OF MOLTEN SALT TECHNOLOGY FOR PYROLYSIS OF SOLID WASTE Final Report
V. L. Hammond and L. K. Mudge Jan. 1975 87 p refs
(Contract EPA-68-03-0145)
(PB-238674/6; EPA-670/2-75-014) Avail: NTIS HC $4.75 CSCL 13B

Laboratory scale studies were conducted on the pyrolysis of a typical refuse mix in molten sodium carbonate. Gasification of the char that resulted from pyrolysis of solid waste was studied at different conditions using steam, air and oxygen as the gasification agent. The effects of contaminants that are introduced to the molten salt during processing of municipal refuse on gasification rates and corrosion were determined. Information obtained in the laboratory studies was used to prepare conceptual process and equipment flow diagrams for evaluation of process economics. The processing of municipal refuse in molten sodium carbonate was found to be technically feasible but economically impractical, pending development of a simplified ash removal process. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-22207 Minnesota Univ., Minneapolis.
ASTRONOMICAL WATER VAPOR MASERS Ph.D. Thesis
Sun Kwok 1974 127 p
Avail: Univ. Microfilms Order No. 75-2116

Water vapor maser emission was observed in many late type stars with expanding circumstellar envelopes. Under the assumption of collisional excitation, solutions are obtained for the thirty-one level water molecule radiative transfer problem. Model circumstellar envelopes for cool stars were also constructed in which dust grains condense and grow, and in which outflow is driven by radiation pressure. The expansion velocity as a function of distance is found for six sample stars and under different degrees of dust condensation. The OH and H2O maser emission from these models are also predicted under simplifying assumptions. Observed features of relative line positions, angular distributions and OH line shapes are reproduced. Comparison of the model with optical observations shows that in many Mira stars the optical absorption lines are red shifted in the scattering expanding envelopes by about 4km/sec. Dissert. Abstr.

N75-22208 Texas Univ., Austin.
THE CALCULATION OF SUPERNOVA LIGHT CURVES Ph.D. Thesis
Sydney Westervelt Falk, Jr. 1974 170 p
Avail: Univ. Microfilms Order No. 75-4361

Observational data are discussed pertaining to supernova phenomena, along with a summary of prior attempts to account for various of these features. The physics and numerical techniques appropriate to the treatment of coupled hydrodynamics and radiation transport are discussed. The methods of pseudo-viscosity, equilibrium photon diffusion, and frequency dependent photon transport in matter in local thermodynamic equilibrium are used to calculate the passage of strong shock waves through extended red giant-like stellar envelopes, in an attempt to account for the main features of observed supernova. Models are presented which show good agreement with the general characteristics of observed supernova events, including velocities of expansion, temperatures, and overall light curve morphology. The results suggest that a rough systemization of these features with physical parameters such as mass, radius, composition, and explosion energy may be possible. Dissert. Abstr.

N75-22209 Cornell Univ., Ithaca, N.Y.
COOLING OF SUPERFLUID NEUTRON STARS Ph.D. Thesis
Robert Charles Malone 1974 330 p
Avail: Univ. Microfilms Order No. 74-17650

The problem of the cooling rates of neutron stars was re-examined to take into account the effects of a superfluid energy gap on the heat content of the nucleons and on various neutrino loss rates. The rate of the modified Urca process, which was the dominant neutrino energy loss mechanism in earlier calculation, is severely reduced by the presence of the superfluid gap in the energy spectrum of neutrons and protons for central

temperatures. Calculations include all neutrino loss mechanisms of importance and a careful treatment of the surface opacity and radiative luminosity. The computer calculations include a full treatment of radiative transfer, which is of particular interest during the very high temperatures. The implications of the results for observation of thermal X-rays from neutron stars and for other aspects of pulsar behavior are discussed. The calculations indicate that the cooling times are not altered significantly from those of earlier calculations; the reductions in the heat capacity and neutrino rates engendered by nucleon superfluidity tend to cancel each other. Dissert. Abstr.

N75-22210 Louisiana State Univ., Baton Rouge.
A FINE ANALYSIS OF THE HELIUM-RICH STAR HD 184927 Ph.D. Thesis
Norman Arthur Higginbotham 1974 196 p
Avail: Univ. Microfilms Order No. 75-1932

The analysis was performed by using a grid of flux-constant model atmospheres which was computed utilizing a modified version of the program ATLAS. The models were computed on a grid bracketing the atmospheric parameters of HD 184927, as determined by an initial coarse analysis. The entire grid was computed under the assumption of local thermodynamic equilibrium, and all relevant opacities were employed. Helium profiles were computed with a code, and Balmer lines employed were computed with the semi-empirical theory of Edmonds, Schluter, and Wells. Observational material includes both high and moderate dispersion spectrograms covering the spectral region lambda 3600-lambda 6200 A and moderate resolution spectral scans. The final model was adopted to match the following criteria: (1) equal hydrogen abundance from both the hydrogen and helium equivalent widths, (2) ionization equilibria of Si II/Si III and S II/S III, (3) H gamma and H beta profiles, (4) He I, lambda-lambda 4471, 4388, 4143 profiles, and (5) the continuous flux distribution (Balmer discontinuity). All metallic abundances were calculated from the final model. Dissert. Abstr.

N75-22211 Michigan Univ., Ann Arbor.
THE ABUNDANCE OF SODIUM IN THE RED GIANTS ALPHA TAURI AND BETA GEMINORUM Ph.D. Thesis
James Charles LoPresto 1974 85 p
Avail: Univ. Microfilms Order No. 75-25257

An analysis of the atmospheres of Alpha Tauri and Beta Geminorum was carried out. High resolution spectroscopic coude plates and photoelectric energy distribution measurements were provided for the analysis. Microdensitometer tracings were obtained for twenty-one separate spectra on seven plates. After the tracings were calibrated, selected spectral regions were aligned according to wavelength and averaged with the aid of a computer program. The separate tracings and the averages were displayed on Calcomp plots, and equivalent widths, half-widths, and line depths were measured for lines of iron, sodium, magnesium and calcium in the selected spectral regions. Model atmospheres, line profiles, and theoretical curves of growth were also calculated using computer programs. The comparison of the computed and observed curves of growth and line profiles allowed for the determination of the microturbulence and macroturbulence, as well as the abundances of iron, sodium, magnesium, and calcium. Dissert. Abstr.

N75-22212 Texas Univ., Austin.
THE APPARENT LUMINOSITY FUNCTION OF GALAXIES TO THE TWENTY-FIRST MAGNITUDE Ph.D. Thesis
George Stanley Brown 1974 161 p
Avail: Univ. Microfilms Order No. 75-4335

The galaxy distribution was investigated in depth by counts to several limiting magnitudes. A reducing camera was built and used at the cassegrain foci of the 36-inch and 82-inch telescopes at McDonald Observatory. Photographs were taken of 13 fields in the north galactic polar cap, each field covering 0.346 square degree (36-inch) and 0.066 square degree (82-inch). Exposures of 10, 30, and 90 minutes were made in each area with the 36-inch and 90 minutes with the 82-inch, giving approximate limiting magnitudes of 18, 19, 20 and 21. Galaxies and stars were counted through a binocular microscope by laying a counting grid over the plates. The limiting magnitude of each plate was obtained by a combination of photoelectric and photographic photometry. Four standard stars (12 - 14 mag.) were measured photoelectrically in each area. A computer model for fixed aperture 'Schilt type' photographic photometry was written and used to extrapolate from the photoelectric standards to the plate limit. Dissert. Abstr.

N75-22213 Wisconsin Univ., Madison.
ULTRAVIOLET OBSERVATIONS OF CLASSICAL CEPHEIDS OF OAO-2 Ph.D. Thesis
James Leach Hutchinson 1974 235 p
Avail: Univ. Microfilms Order No. 74-28808

Ultraviolet observations obtained by the Wisconsin Experiment Package on OAO-2 are reported. The temporal ultraviolet behavior is found to mimic that of the visible region but with much larger amplitudes; the amplitude shows a strong linear correlation with wave number. Due to the faintness of late-type stars in the ultraviolet, the best cepheid data were produced by the filter photometers at effective wavelengths of 4250 A, 3350 A, 3075 A, 2590 A and 2210 A. A few spectrometer scans at about 20 A resolution were attempted and data of limited usefulness were obtained between wavelengths 2600 - 3600. All data were corrected for instrumental effects, the brightness of the sky background, and reddening due to interstellar extinction. A provisional absolute calibration enabled comparison of these data with ground-based observations. Dissert. Abstr.

N75-22214*# Northwestern Univ., Evanston, Ill. Astronomy Dept.
TIME VARIATIONS OF UV EMISSION FEATURES OF Be STARS Final Report, 1 Aug. 1972 - 31 Jan. 1975
John D. R. Bahng 31 Jan. 1975 35 p refs
(Grant NGR-14-007-122)
(NASA-CR-142618) Avail: NTIS HC $3.75 CSCL 03A

The UV spectra of three Be stars (gamma Cas, sigma Tau, eta Cen) were studied. Of the six Be stars observed in the first four lines of the Balmer series, three stars showed at least one of the Balmer lines to be variable in the equivalent width amounting to a few percent with time scales of 3 to 30 minutes. Photoelectric spectrum scans of five southern Wolf-Rayet stars showed night-to-night variations. A simple model is proposed to account for the behavior of these emission lines. Scans of gamma square Vel showed rapid variations of emission strengths of He II 4686 and C III - IV 4650. These variations have time scales of 1 minute and longer. Night-to-night variations were also found. Scans of four Be stars in H alpha showed a definite variation of 3 to 4 percent, with time scales of 1 minute and longer in sigma Tau. In 48 Per and kappa Dra the variations are not as well established. No variation of any significance was found for nu Gem. Author

N75-22215*# Illinois Univ., Urbana. Dept. of Astronomy.
VERY LONG BASELINE INTERFEROMETRY USING A COMMUNICATION SATELLITE Final Technical Report, Jun. - Sep. 1974
G. W. Swenson, Jr. 15 Mar. 1975 13 p ref
(Grant NsG-7030)
(NASA-CR-142667) Avail: NTIS HC $3.25 CSCL 03B

A planned experiment is discussed in long-baseline interferometry, using the Communications Technology Satellite to transmit the base-band signal from one telescope to another for real-time correlation. A 20 megabit data rate is planned, calling for a delay-line of 10 MHz bandwidth and controllable delay up to 275 milliseconds. A number of sources will be studied on baselines from Ontario to West Virginia and California. Author

N75-22216*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A TIMELINE ALGORITHM FOR ASTRONOMY MISSIONS
John E. Moore and Orville T. Guffin Apr. 1975 57 p refs
(NASA-TM-X-64921) Avail: NTIS HC $4.25 CSCL 03A

An algorithm is presented for generating viewing timelines for orbital astronomy missions of the pointing (nonsurvey/scan) type. The algorithm establishes a target sequence from a list of candidate targets in a way which maximizes total viewing time. Two special cases are treated. One concerns dim targets which, due to lighting constraints, are scheduled only during the antipolar portion of each orbit. They normally require long observation times extending over several revolutions. A minimum slew heuristic is employed to select the sequence of dim targets. The other

case deals with bright, or short duration, targets, which have less restrictive lighting constraints and are scheduled during the portion of each orbit when dim targets cannot be viewed. Since this process moves much more rapidly than the dim path, an enumeration algorithm is used to select the sequence that maximizes total viewing time. Author

N75-22217*# American Science and Engineering, Inc., Cambridge, Mass.
ANS HARD X-RAY EXPERIMENT DEVELOPMENT PROGRAM Final Report, Nov. 1970 - Sep. 1974
D. Parsignault, Herbert Gursky, R. Frank, K. Kubierschky, G. Austin, R. Paganetti, and V. Bawdekar 30 Sep. 1974 146 p
(Contract NAS5-11350)
(NASA-CR-143724; ASE-3604) Avail: NTIS HC $5.75 CSCL 03A

The hard X-ray (HXX) experiment is one of three experiments included in the Dutch Astronomical Netherlands Satellite, which was launched into orbit on 30 August 1974. The overall objective of the HXX experiment is the detailed study of the emission from known X-ray sources over the energy range 1.5-30keV. The instrument is capable of the following measurements: (1) spectral content over the full energy range with an energy resolution of approximately 20% and time resolution down to 4 seconds; (2) source time variability down to 4 milliseconds; (3) silicon emission lines at 1.86 and 2.00keV; (4) source location to a limit of one arc minute in ecliptic latitude; and (5) spatial structure with angular resolution of the arc minutes. Scientific aspects of experiment, engineering design and implementation of the experiment, and program history are included. Author

N75-22218*# Princeton Univ., N.J. Dept. of Astrophysical Sciences.
STUDY OF PERMANENT MAGNET FOCUSING FOR ASTRONOMICAL CAMERA TUBES Final Report
D. C. Long and J. L. Lowrance 28 Feb. 1975 109 p refs
(Contract NAS5-20507)
(NASA-CR-143716) Avail: NTIS HC $5.25 CSCL 03A

A design is developed of a permanent magnet assembly (PMA) useful as the magnetic focusing unit for the 35 and 70 mm (diagonal) format SEC tubes. Detailed PMA designs for both tubes are given, and all data on their magnetic configuration, size, weight, and structure of magnetic shields adequate to screen the camera tube from the earth's magnetic field are presented. A digital computer is used for the PMA design simulations, and the expected operational performance of the PMA is ascertained through the calculation of a series of photoelectron trajectories. A large volume where the magnetic field uniformity is greater than 0.5% appears obtainable, and the point spread function (PSF) and modulation transfer function(MTF) indicate nearly ideal performance. The MTF at 20 cycles per mm exceeds 90%. The weight and volume appear tractable for the large space telescope and ground based application. Author

N75-22219# Belgian Royal Observatory, Brussels.
YEARBOOK OF THE ROYAL BELGIAN ASTRONOMICAL OBSERVATORY, 1975 [ANNUAIRE DE L'OBSERVATOIRE ROYAL DE BELGIQUE, 1975]
1975 214 p In FRENCH and DUTCH
Avail: NTIS HC $7.25

Astrophysical observational data are presented for the Sun, the Moon, and the planets Mercury, Venus, Mars, Jupiter and Saturn. Transl. by G.G.

N75-22220*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE OSCILLATION OF THE LATERALLY HETEROGENEOUS EARTH, 1
Peter Musen Jan. 1975 39 p refs Submitted for publication
(NASA-TM-X-70869; X-920-75-62) Avail: NTIS HC $3.75 CSCL 03C

The perturbative effects, as cause by lateral inhomogeneities in the earth structure and by Coriolis force, contaminate the originally toroidal and spheroidal earth's oscillations, making them of mixed type. For this reason, in order to make the computation of the perturbations more uniform and homogeneous, it was suggested that the earth's free oscillations be expanded into a series in terms of generalized harmonics familiar from the theory of angular momentum in quantum mechanics. Making use of Gibbsian symbolism and of some operators from the theory of angular momentum, explicit expressions were deduced for the perturbative terms in the differential equation of the earth's free oscillations. Decomposition of the strain tensor in terms of canonical vectors was also obtained. Author

N75-22221*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
FAR INFRARED SPECTROSCOPY OF THE ORION NEBULA
Dennis B. Ward [1975] 11 p refs
(Grant NGR-33-010-146)
(NASA-CR-142697) Avail: NTIS HC $3.25 CSCL 03B

A coarse resolution spectrum of the Orion Nebula between 65 and 125 microns is presented which closely fits the color dependence of a 75 K blackbody. A high resolution search for O III at 88.16 microns yields an upper limit below theoretical predictions. Observations were carried out in November, 1974, using the 31 cm gyrostabilized telescope mounted in the NASA Lear jet. The instrument employed was a fully liquid helium cooled grating spectrometer with a 3 mm entrance slit that gave a square beam on the sky, 5 arc minutes in diameter. The results are presented. Author

N75-22222# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex. Atmospheric Sciences Lab.
MOONRISE, MOONSET AND MOON PHASES FOR 1975 Meteorological Data Report
David J. Novlan Dec. 1974 23 p refs
(DA Proj. 1T6-65702-D-127)
(AD-A003240; DR-858) Avail: NTIS CSCL 03/1

Contents: Times of moonrise, moonset and moon phases at WSMR in 1975; Use of solar-lunar charts and declination tables--(Solar altitudes and azimuths, Base for plotting lunar altitudes and azimuths, The celestial sphere); Equinoxes and solstices, 1975--(Light curve of the moon); Illumination due to the moon; (Times of sunrise and sunset, and beginnings and endings of civil, nautical and astronomical twilight); Times of moonrise, moonset and moon phases for 1975. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-22223 Arizona Univ., Tucson.
EVOLUTIONARY EFFECTS ON RADIALLY VARYING PROPERTIES OF COMA CLUSTER GALAXIES Ph.D. Thesis
Stephen Albert Gregory 1974 80 p
Avail: Univ. Microfilms Order No. 75-4111

A sample of galaxies brighter than mp = 15.7 out to a radial distance of 2.79 deg from the Coma cluster center is essentially completed by new observations of redshifts, morphology, and color. The redshift results show that the velocity dispersion first decreases and then increases again with distance from the center. The mean velocity dispersion is found to be 712 Km/sec in the line of sight. A marginally positive test for solid body rotation of 86 + or - 66 Km/sec/degree is also found. The morphology and color data show two interesting features. First, the relative number of spiral and irregular galaxies is shown to increase with radial distance. Secondly, E and SO galaxies located far from the cluster center appear to be bluer than those near the center. These observations are discussed in terms of two theories of cluster formation and are shown to be consistent with numerical models of the collapse of axisymmetric rotating systems in which star formation had already occurred at the time of maximum cluster radius. Dissert. Abstr.

N75-22224 Texas Univ., Austin.
A CAPTURE MODEL FOR THE FORMATION OF BINARY STARS AND BINARY GALAXIES Ph.D. Thesis
Gene Gilbert Byrd 1974 169 p
Avail: Univ. Microfilms Order No. 75-4338

Star cluster formation and observational evidence of disk-

shaped nebulae around young stars is reported and it is shown that the possibility of binary star formation via tidal interaction of such nebulae during close stellar encounters should be investigated. Such an investigation was carried out via computer models for parabolic encounters with each star surrounded by dynamically supported disk nebulae of mass equal to the stars'. Other trials were also run with a more conservative nebular mass of 0.1 that of the stars'. The computer model used can only handle two-dimensional configurations with the disk planes in the encounter orbit plane. Also, valid results were gathered only for limited amounts of tidal disruption of the nebulae. The model used a technique of calculating the gravitational field of a continuous disk that was recently proposed by Clutton-Brock. Dissert. Abstr.

N75-22225 California Inst. of Tech., Pasadena.
FRAMEWORKS FOR ANALYSING AND TESTING THEORIES OF GRAVITY Ph.D. Thesis
David Li Lee 1974 162 p
Avail: Univ. Microfilms Order No. 74-24447

Theoretical frameworks for the analysis and testing of gravitation theories - both metric and nonmetric are reported. For nonmetric theories, the high precision Eotvos-Dicke-Braginskii (EDB) experiments are demonstrated to be powerful tests of their gravitational coupling to electromagnetic interactions. All known nonmetric theories are ruled out to within the precision of the EDB experiments. A metric theory of gravity that cannot be distinguished from general relativity in all current and planned solar system experiments is presented. However, this theory has very different gravitational-wave properties. Hence, the need for further tests of metric theories beyond the parametrized Post-Newtonian formalism was pointed out and the importance of the observation of gravitational waves as a tool for testing relativistic gravity in the future was emphasized. A theory-independent formalism delineating the properties of weak, plane gravitational waves in metric theories is set up. Dissert. Abstr.

N75-22226 Colorado Univ., Boulder.
FORMATION OF PLANETARY NEBULAE Ph.D. Thesis
Peter Edward Stry 1974 84 p
Avail: Univ. Microfilms Order No. 75-3838

Both direct and indirect observations of planetary nebulae and their stars imply that their precursors were red supergiant stars with total masses of about 1.2 solar mass and envelope masses of about 0.2 solar mass. Because of their huge radii these envelopes are only loosely bound and a large number of mechanisms were proposed to explain their ejection and the consequent formation of planetary nebulae. A grid of envelope models was constructed spanning the red supergiant region, each corresponding to total mass 1.2 solar mass. From these a series of optimum models with 0.2 solar mass envelopes was interpolated extending from L = 10,000 solar luminosity up to nearly the critical luminosity. These were tested for linear instabilities. The first and second harmonics were found to be overstable as expected with periods characteristic of Miras. No dynamical instability was found and in particular the fundamental was found to join the secular roots on the stable real axis. Dissert. Abstr.

N75-22227 Louisiana State Univ., Baton Rouge.
ONE AND TWO-ELECTRON ATOMS IN STRONG MAGNETIC FIELDS AND IMPLICATIONS FOR MAGNETIC WHITE DWARFS AND PULSARS Ph.D. Thesis
Garabed Leon Surmelian 1974 131 p
Avail: Univ. Microfilms Order No. 75-1954

A variational calculation is presented using Slater-type trial wavefunctions of the energy spectrum and ionization energy of the hydrogen atom in strong magnetic fields ranging from 10 to the 6th power Gauss (typical of magnetic white dwarf surfaces) to 10 to the 12th power (typical of pulsar surfaces). In addition, bound-bound transition probabilites. Furthermore, a method is developed to generalize the energy level results to any one-electron atom. In particular, results for He II are presented. An exact calculation is presented of the quadratic Zeeman wavelength displacements of the Balmer lines from DA white dwarfs in view of which the estimate of the surface magnetic fields is higher than that obtained by previous, less accurate calculations. Finally the variational calculation is extended to two-electron atoms in strong magnetic fields, and the energy spectrum and ionization energy of He I and the electron affinity of H(-) are also presented. Dissert. Abstr.

N75-22228 Rensselaer Polytechnic Inst., Troy, N.Y.
WAVELENGTH DEPENDENCE OF INTERSTELLAR POLARIZATION Ph.D. Thesis
George E. Mavko 1974 94 p
Avail: Univ. Microfilms Order No. 75-5389

The wavelength dependence of interstellar polarization was measured for twelve stars in three regions of the Milky Way. A 120A bandpass was used to measure the polarization at a maximum of sixteen wavelengths evenly spaced between 3600A and 7800A. For such a wide wavelength range, the wavelength resolution is superior to that of any previously reported polarization measurements. Very broad structure was found in the wavelength dependence of the polarization. Extensive investigations were carried out to show that the structure was not caused by instrumental effects. The broad structure observed is shown to be in agreement with concurrent extinction measurements for the same stars. Also, the observed structure is of the type predicted when a homogeneous silicate grain model is fitted to the observed extinction. The results are in agreement with the hypothesis that the very broad band structure seen in the extinction is produced by the grains. Dissert. Abstr.

N75-22229*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELLING THE MAGNETOSPHERE OF MERCURY
Y. C. Whang (Catholic Univ. of Am.) and N. F. Ness Apr. 1975 23 p refs Submitted for publication
(NASA-TM-X-70873; X-690-75-89) Avail: NTIS HC $3.25 CSCL 03B

A model magnetosphere for Mercury is presented using an upstream image-dipole and nightside 2-dimensional tail current sheet method. The tail field is represented by an analytical formulation. Magnetic field data from the Mercury 1 encounter by Mariner 10 in March 1974 are used to determine quantitative parameters of the model magnetosphere, using the method of least squares. The magnetopause crossing points directly observed are used to determine the size of the magnetosphere, and the solar wind conditions are used to determine the magnetospheric field at the stagnation point. The model produces a magnetosphere-like region with planetary field lines that are confined in nearly circular cross-sections transverse to the sun-planet line. Results are used to show geometry, field line configuration, and contours of constant field intensity inside the magnetosphere. Author

N75-22230*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD OF MERCURY CONFIRMED
N. F. Ness, K. W. Behannon, R. P. Lepping, and Y. C. Whang (Catholic Univ. of Am.) Apr. 1975 12 p refs Submitted for publication
(NASA-TM-X-70872; X-690-75-88) Avail: NTIS HC $3.25 CSCL 03B

A contention that Mercury possesses an intrinsic magnetic field sufficient to deflect the solar wind flow was confirmed by the Mariner 10 experiment. Predictions made as to the locations where characteristic bow shock and magnetopause boundaries may be observed were also confirmed. E.H.W.

N75-22231# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
GLOBAL SCINTILLATION MODEL
J. H. Pope Aug. 1974 37 p refs
(COM-75-50059/5; NOAA-TR-ERL-308; SEL-30; NOAA-74121115) Avail: NTIS HC $3.75 CSCL 03B

A recently developed global scintillation model and its use for estimating scintillation effects under various operational conditions is described. This model includes frequency, solar cycle activity, seasonal effects, diurnal effects, and variations with global location. Certain geometrical effects are also considered. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-22232 Minnesota Univ., Duluth.
RARE GASES IN APOLLO 11 FINES Ph.D. Thesis
Jeffrey Rogers Basford 1974 124 p
Avail: Univ. Microfilms Order No. 75-2085

This history of Mare Tranquillitatus regolith is studied with rare gas and mass spectrometric techniques. Grain size-ordinate intercept analyses are applied to bulk soil, ilmenite and plagioclase size separates obtained from < 1 mm fines sample 10084,48. Thermal release of a < 1 micron total soil size separate is also examined in a step heating experiment. Carbide, methane and rare gas contents in an organic aliquot of 10084 (10086D) are analyzed and discussed. He, Ne, Ar, Kr, and Xe concentrations and compositions were determined for all the grain size and temperature examinations performed. K, Rb, Sr, and Ba concentrations were measured in aliquots of these samples. The results for the 10086D examinations are reported in terms of carbide, methane and rare gas concentrations only.
Dissert. Abstr.

N75-22233 Texas A&M Univ., College Station.
THE MAGNETIZATION OF CARBONACEOUS METEORITES Ph.D. Thesis
James Marvin Herndon 1974 124 p
Avail: Univ. Microfilms Order No. 75-2861

Alternating field demagnetization experiments were conducted on representative samples of the carbonaceous meteorites (carbonaceous chondrites and ureilites). The results indicate that many, if not all, of these meteorites possess an intense and stable magnetic moment of extraterrestrial origin. Thermomagnetic analyses were conducted on samples of all known carbonaceous meteorites. In addition to yielding quantitative magnetite estimates, these studies indicate the presence of a thermally unstable component, troilite, which reacts with gaseous oxygen to form magnetite. It is proposed that the magnetite found in some carbonaceous chondrites resulted from the oxidation of troilite during the early history of the solar system. The formation of pyrrhotite is expected as a natural consequence of magnetite formation via this reaction. Consideration is given to the implications of magnetite formation on paleointensity studies.
Dissert. Abstr.

N75-22234 Utah Univ., Salt Lake City.
FRACTURE SYSTEMS AND TECTONICS OF MARS Ph.D. Thesis
Edwin Lynn Harp 1974 116 p
Avail: Univ. Microfilms Order No. 75-4785

Fractures of the Martian crust were mapped from a uniform sampling of Mariner 9 imagery from 50 N to 50 S and parallel to the equator. During this mapping, a coherent planet wide fracture fabric was identified as well as fabrics associated with regional tectonic provinces. The planet wide fabric consists of two orthogonal fracture sets, one oriented approximately N45 E and the other set N45 W. Due to its great relative density within the oldest surfaces and its apparent influence upon the regional tectonic systems, it is presumed to be the oldest group of tectonic elements recognizable within the Martian crust. The largest regional tectonic system is that of the Tharsis complex, whose influence extends throughout most of the Western Hemisphere. It consists of broad, regional uplift and associated volcanism. The radial fracture pattern suggests that the extensional principal stress direction, is concentric to the approximate center of the Tharsis region.
Dissert. Abstr.

N75-22235*# Little (Arthur D.), Inc., Cambridge, Mass.
TECHNIQUES FOR CARRYING OUT RADIATIVE TRANSFER CALCULATIONS FOR THE MARTIAN ATMOSPHERIC DUST Final Report, Jun. 1973 - Sep. 1974
J. R. Aronson, A. G. Emslie, and P. F. Strong Sep. 1974 62 p refs
(Contract NAS5-23257)
(NASA-CR-143693) Avail: NTIS HC $4.25 CSCL 03B

A description is given of the modification of a theory on the reflectance of particulate media so as to apply it to analysis of the infrared spectra obtained by the IRIS instrument on Mariner 9. With the aid of this theory and the optical constants of muscovite mica, quartz, andesite, anorthosite, diopside pyroxenite, and dunite, modeling calculations were made to refine previous estimates of the mineralogical composition of the Martian dust particles. These calculations suggest that a feldspar rich mixture is a very likely composition for the dust particles. The optical constants used for anorthosite and diopside pyroxenite were derived during this program from reflectance measurements. Those for the mica were derived from literature reflectance data. Finally, a computer program was written to invert the measured radiance data so as to obtain the absorption coefficient spectrum which should then be independent of the temperature profile and gaseous component effects.
Author

N75-22236*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE JOVIAN ELECTRON SPECTRUM AND SYNCHROTRON RADIATION AT 375 cm
Thomas J. Birmingham Apr. 1975 15 p refs
(NASA-TM-X-70876; X-602-75-94) Avail: NTIS HC $3.25 CSCL 03B

The synchrotron radiation expected at Earth from the region L=2.9-5 R sub J of Jupiter's magnetosphere is calculated using the Pioneer 10 electron model. The result is approximately 21 flux units (f.u.). This value is to be compared with 6.0 + or - 0.7 f.u., the flux density of synchrotron radiation measured from Jupiter's entire magnetosphere in ground-based radio observations. Most of the radiation at 375 cm is emitted by electrons in the 1 to 10 MeV range. If the electron model used for calculations is cut off below 10 MeV, the calculated flux is reduced to approximately 4 f.u., a level compatible with the radio observations.
Author

N75-22237*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
THE BULK LUNAR ELECTRICAL CONDUCTIVITY Ph.D. Thesis. Final Report
Donald Lucien Leavy Jan. 1975 200 p refs
(Grant NGL-22-009-187)
(NASA-CR-142696) Avail: NTIS HC $7.00 CSCL 03B

The electrical conductivity structure was studied of a spherically layered moon consistent with the very low frequency magnetic data collected on the lunar surface and by Explorer 35. In order to obtain good agreement with the lunar surface magnetometer observations, the inclusion of a void cavity behind the moon requires a conductivity at shallow depths higher than that of models having the solar wind impinging on all sides. By varying only the source parameters, a conductivity model can be found that yields a good fit to both the tangential response upstream and the radial response downstream. This model also satisfies the dark side tangential response in the frequency range above 0.006 Hz, but the few data points presently available below this range do not seem to agree with the theory.
Author

N75-22238*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A PHOTOMETRIC FUNCTION FOR DIFFUSE REFLECTION BY PARTICULATE MATERIALS
Willard E. Meador and Willard R. Weaver Washington Apr. 1975 39 p refs
(NASA-TN-D-7903; L-10021) Avail: NTIS HC $3.75 CSCL 03B

A photometric function is proposed to describe the diffuse reflection of radiation by particulate materials. Both multiple scattering and the dominant effects of particle shadowing are included and the function is verified by comparisons with the photometries of laboratory surfaces. Brightness measurements of planetary and other diffusely scattering surfaces can be used to calculate the brightness for geometries other than those used in the measurements and for which the Minnaert function does not apply. The measurements also can be directly related to

such surface characteristics as particle size, single-particle albedo, and compactness. Author

N75-22239# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
SEARCH FOR TRACES OF HEAVY AND SUPERHEAVY ELEMENTS IN METEORITES
G. N. Flerov, O. Otgonsuren, and V. P. Perelygin 1974 21 p refs In RUSSIAN; ENGLISH summary
(JINR-P7-8135) Avail: ERDA Depository Libraries HC $4.25

The results of experiments on revealing and identifying the tracks of very heavy cosmic nuclei in olivines from pallasite meteorites are presented. In the Marjalahti meteorite, whose cosmic age is 180 million years, the density of the Fe group tracks reaches (5 to 6) x 1 million l/sq cm. By taking into account reductions from 13 or 14 cm to 8 microns in the tracks of the Fe group nuclei under space conditions, it is shown that these tracks are located up to 5 to 6 cm deep from the preatmospheric surface of the meteorite. For sensitivity calibration these olivines were bombarded by 5 to 6 MeV/nucleon Ti, Cr, Fe, Zn, Ge, Kr, and Xe ions and the thermal fading of artificial tracks was investigated. The effect of thermal fading does not seem to reduce the tracks of very heavy cosmic nuclei considerably. Measurements were carried out by using very long tracks in 40 cu mm of minerals from the Marjalahti meteorite. The analysis shows that the search and identification of the tracks of superheavy cosmic nuclei should be carried out by using crystals located up to 1 or 2 cm from the preatmospheric surface meteorites.
Author (NSA)

N75-22240# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
SEARCH FOR SUPERHEAVY ELEMENTS IN METEORITES
A. G. Popeko, N. K. Skobelev, G. M. Ter-Akopyan, and G. N. Goncharov 1974 22 p refs In RUSSIAN
(JINR-P7-8042) Avail: ERDA Depository Libraries HC $4.25

Measurements of neutron emission from the Saratov, Efremovka and Allende meteorites were performed by using neutron multiplicity detectors. An activity exceeding the background due to spontaneous fission of uranium was recorded. The possible relationship of the activity observed to both spontaneous fission of superheavy elements and anomalies in the content of heavy Xe isotopes in meteorites is discussed.
Author (NSA)

N75-22257* Kanner (Leo) Associates, Redwood City, Calif.
LUNAKHOD-2 IN LEMONNIER CRATER
A. Koval *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 5-19 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 7-21 (For availability see N75-22255 13-99)
CSCL 22A

N75-22259* Kanner (Leo) Associates, Redwood City, Calif.
LUNAKHOD-2: PRELIMINARY RESEARCH RESULTS
A. Vinogradov and S. Sokolov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 39-50 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 41-50 (For availability see N75-22255 13-99)
CSCL 22A

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-22241 Colorado State Univ., Fort Collins.
A SEARCH FOR SOLAR PARTICLE PRODUCTION ABOVE APPROXIMATELY 75 GeV Ph.D. Thesis
Stephen Michael Schindler 1974 278 p
Avail: Univ. Microfilms Order No. 75-4614

An experiment was constructed to investigate the possibility of solar particle production in the energy region above approximately 75 GeV. A narrow angle muon telescope capable of maintaining continuous orientation with respect to a highly anisotropic particle flux, was employed in the research. For specific resolution of a very high energy solar particle component, the detecting system was located underground at a nominal vertical depth of 200 mwe. After approximately 2,500 hours of initial operation, a positive correlation was obtained between a significant intensity increase and a specific solar event. The event of interest was an M8, importance 2N/2B flare which took place at approximately 1330 UT on 3 October 1971. Analysis of the event leads to an interpretation of the results in terms of a flare generated particle component of energy approximately > 75 GeV. The results are consistent with high energy particle acceleration being confined mainly to the early phase of flare development, and prior to the H alpha maximum. Dissert. Abstr.

N75-22242*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SOLAR ELOGATION DISTRIBUTION OF LOW FREQUENCY RADIO BURSTS
M. L. Kaiser Apr. 1975 18 p refs Submitted for publication
(NASA-TM-X-70883; X-693-75-99) Avail: NTIS HC $3.25 CSCL 03B

Over 500 days of low frequency (less than 5 MHz) radio observations from the IMP-6 spacecraft were accumulated to produce a two dimensional map (frequency versus elongation) of solar type III burst occurrences. This map indicates that most solar bursts are emitted at the second harmonic of the plasma frequency rather than the fundamental. The map also shows that the solar wind electron density varies. Author

N75-22243# Sandia Labs., Albuquerque, N.Mex.
SIZING OF FOCUSED SOLAR COLLECTOR FIELDS WITH SPECIFIED COLLECTOR TUBE INLET TEMPERATURE
D. O. Lee, W. P. Schimel, Jr., and J. P. Abbin, Jr. Nov. 1974 45 p refs
(Contract AT(29-1)-789)
(SAND-74-0295) Avail: NTIS HC $3.75

An axial temperature differential analysis was used to size the collector field required to power a 40-kW (electrical) load. The number of north-south-oriented collectors required to furnish the desired energy and temperature rise in the collector fluid was determined by the requirements of several typical organic working fluid Rankine-cycle energy conversion systems. Calculations based on heliostatically mounted collector systems and fixed-tilt east-west tracking collector systems are presented. The collector matrix sizes obtained by these calculations are somewhat optimistic because the effects of wind losses and shadowing by adjacent collectors are not considered. No losses are considered for connections between collectors. Losses in the Rankine-cycle power conversion loop are considered. This analysis is thus valid for a lossless, 'infinitely' spaced collector field. Author (NSA)

N75-22244# Harvard Coll. Observatory, Cambridge, Mass.
RESEARCH STUDY ON DYNAMICS OF THE SOLAR ATMOSPHERE Final Report, 1 Jan. 1972 - 30 Jun. 1974
Barbara Bell and Donald H. Menzel Jul. 1974 8 p refs
(Contract F19628-72-C-0146; AF Proj. 7649)
(AD-A002382; AFCRL-TR-74-0357) Avail: NTIS CSCL 03/2

This report summarizes studies carried out in magnetohydrodynamics and a new form of gravitational force. It describes coronal studies at two eclipses, reviews an attempt to verify (with negative results) a finding by Gnevyshev that the sunspot cycle on the average has a double maximum, and covers research in the general area of solar-terrestrial relations. Relationships between the intensity of the extreme ultraviolet (EUV) emission-line corona, the level of geomagnetic activity, and the velocity of the solar wind are discussed. GRA

N75-22245# Photometrics, Inc., Lexington, Mass.
AREA AND SPACE INTEGRATED LIGHT DEFICIT OF SUNSPOT IMAGES Final Report, 1 Apr. 1973 - 30 Jun. 1974
Christian A. Trowbridge and Carlton S. Miller 31 Jul. 1974 53 p refs
(Contract F19628-73-C-0268; AF Proj. 8608)
(AD-A003391; PhM-107-74; AFCRL-TR-74-0352) Avail: NTIS CSCL 03/2

Microdensitometric film reduction, analysis and display

techniques, and digital computer analysis and display were applied to solar surface radiance data. Photographs of sunspot activity were converted to isophote contour maps and digital optical density arrays recorded on magnetic tape. Edge discrimination and background-correction procedures were developed to semi-automatically determine sunspot area and integrated light deficit from these digital data. Sample results of the methods developed are given. GRA

N75-22246# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DETECTION AND CLASSIFICATION OF SOLAR X-RAY FLARES USING VLF PHASE AND AMPLITUDE INFORMATION Environmental Research Papers
Paul A. Kossey and Edward A. Lewis 20 Sep. 1974 39 p refs
(AF Proj. 4603)
(AD-A003383; AFCRL-ERP-486; AFCRL-TR-74-0468) Avail: NTIS CSCL 03/2

An extensive data base consisting of VLF records for 130 different propagation paths over a 2-year period was analyzed statistically to study the correlation of VLF propagation changes with solar X-ray events recorded by satellites. Results of the study indicate that with reasonable restrictions on path illumination conditions, it is possible to detect and classify solar X-ray flares, in near realtime, by proper interpretation of VLF phase and amplitude variations. A method of calibrating VLF paths for this purpose is discussed, and a possible global network of receiving stations capable of 24-hr per day monitoring of solar X-rays is described. GRA

N75-22247# Harvard Coll. Observatory, Cambridge, Mass.
ACTIVE REGION FLARE RATES AND 8.6 mm BRIGHTNESS TEMPERATURES
George L. Withbroe and Jorge E. Vernazza 1 Oct. 1974 33 p refs
(Contract F19628-74-C-0018; AF Proj. 4643)
(AD-A003400; SR-1; AFCRL-TR-74-0519) Avail: NTIS CSCL 03/2

The relationship between flare rate and 8.6 mm brightness temperature was analyzed using data from 99 active regions present on the solar disk in 1969 and 1970. The rate of flaring appears to increase exponentially with 8.6 mm brightness temperature T sub b, for T sub b - 9200 K. For higher temperatures, the rate of flaring appears to remain nearly constant, independent of T sub b. The resulting empirical relationship provides a quantitative means of estimating flare rates from an easily measured parameter, the 8.6 mm brightness temperature. GRA

N75-22261* Kanner (Leo) Associates, Redwood City, Calif.
PROGNOZ REPORTS
G. Narimanov and N. Pisarenko *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 57-62 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 56-60 (For availability see N75-22255 13-99)
CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-22248 Wisconsin Univ., Madison.
A MAP OF DIFFUSE LOW ENERGY X-RAYS FROM THE GENERAL DIRECTION OF THE GALACTIC ANTI-CENTER Ph.D. Thesis
Fred Othar Williamson 1974 104 p
Avail: Univ. Microfilms Order No. 74-28835

An Aerobee 170 sounding rocket was flown from White Sands on February 18, 1972 and scanned the region bounded by 180 deg equal to or less than l(II) equal to or less than 280 deg and 0 deg equal to or less than b(II) equal to or less than 30 deg. A complete map of the emission from this region in the energy range .1 equal to or less than E equal to or less than .284 keV was obtained with approximately 6 deg x 6 deg resolution and 10% statistics. A region of enhanced emission bounded by 190 deg equal to or less than l(II) equal to or less than 215 deg and 0 deg equal to or less than b(II) equal to or less than 20 deg and a region of decreased emission bounded by 240 deg equal to or less than l(II) equal to or less than 260 deg and 0 deg equal to or less than b(II) equal to or less than 20 deg are suggested by the map. Dissert. Abstr.

N75-22249 Wisconsin Univ., Madison.
A SEARCH FOR SOFT STELLAR X-RAY SOURCES Ph.D. Thesis
Matthew John Vanderhill 1974 124 p
Avail: Univ. Microfilms Order No. 74-27768

A sensitive soft X-ray survey of about one-tenth of the sky with the S-150 Galactic X-ray Mapping Experiment, flown as part of the Skylab program on July 28, 1973, revealed no evidence for soft X-ray emission from stellar sources. Soft X-ray emission from giant stars, binary stars, and most main sequence stars is unable to account for the observed low energy diffuse X-ray background if the background originates from the super-position of discrete stellar sources. But if white dwarfs and M dwarfs are as numerous as some investigators have proposed, this experiment is unable to eliminate these stars as important contributors to the diffuse X-ray background. Dissert. Abstr.

N75-22250*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
KAON ALPHA X-RAYS FROM COSMIC RAY OXYGEN
Steven H. Pravdo (Md. Univ., College Park) and E. A. Boldt Feb. 1975 24 p refs Submitted for publication
(NASA-TM-X-70870; X-661-75-39) Avail: NTIS HC $3.25 CSCL 03B

Equilibrium charge fractions are calculated for subrelativistic cosmic ray oxygen ions in the interstellar medium. These are used to determine the expected flux of kaon alpha rays arising from atomic processes for a number of different postulated interstellar oxygen spectra. Relating these results to the diffuse X-ray background measured at the appropriate energy (i.e. approximating 0.6 keV) suggests an observable broadened line feature. Author

N75-22251*# Rice Univ., Houston, Tex. Dept. of Physics and Astronomy.
OBSERVATION OF LOW ENERGY PROTONS IN THE GEOMAGNETIC TAIL AT LUNAR DISTANCES M.S. Thesis
David Alfred Hardy Sep. 1974 127 p refs
(Contract NAS9-5911)
(NASA-CR-141732) Avail: NTIS HC $5.75 CSCL 03B

Three suprathermal ion detectors stationed on the moon were used to detect a region of plasma flowing antisunward along the ordered field lines of the geomagnetic tail, exterior to the plasma sheet. The particle flow displays an integral flux, a bulk velocity, temperatures, and number densities uniquely different from the other particle regimes traversed by the moon. No consistent deviation in the field was found to correspond with the occurrence of the events, which have an angular distribution extending between 50 and 100 deg and a spatial distribution over a wide region in both the Y sub sm and Z sub sm directions. The duration of observable particles varies widely between tail passages, with an apparent correlation between the number of hours of observation and the Kp index averages over these times. It is proposed that these particles may have entered through the cusp region. Author

N75-22252# Bergen Univ. (Norway). Dept. of Physics.
PRECIPITATION OF GREATER THAN 115 keV PROTONS IN THE EVENING AND FORENOON SECTORS IN RELATION TO THE MAGNETIC ACTIVITY
R. Hauge and F. Soeraas May 1974 30 p refs
(BUP-66) Avail: ERDA Depository Libraries HC $3.75

Satellite data are presented on auroral protons > 115 keV in the evening and forenoon sectors from the northern hemisphere only. In the forenoon sector, there is a weak but steady

precipitation at Lambda approximately equal to 75 deg during quiet conditions. This precipitation is situated at higher invariant latitudes at local noon than at local dawn and can probably be ascribed to the high energy tail of the polar cleft protons. During moderately disturbed conditions, especially during the recovery phase of geomagnetic storms, there are some precipitation events at Lambda approximately equal to 65 deg. During very disturbed conditions, these two precipitation zones in the forenoon sector seem to merge. In the evening sector, a rather sharp equatorward boundary of the main precipitation, at Lambda approximately equal to 69 deg during quiet conditions, varies rather smoothly from pass to pass. South of this, at invariant latitudes around 62 deg, there is a steady weak drizzle from the radiation belt.
Author (NSA)

99 GENERAL

N75-22253# Defence Research Establishment Valcartier (Quebec).
[LASER, ARMAMENTS, EXPLOSIVES, AND FUEL RESEARCH FOR MILITARY PURPOSES] Annual Report, 1973
[1974] 46 p refs In FRENCH and in ENGLISH
(DREV-705/74) Avail: NTIS HC $3.75

Laser-matter interaction at 10.6 microns was studied and development of high energy TEA-CO2 lasers continued. Optical and infrared systems are being developed to stress military applications. Ordnance research concentrated on pour-castable smoke compositions for use as signaling grenades or smoke signals for air rescue operations. Explosives research and engineering was concerned with castable composite and slurry explosives. Studies of polymer chemistry focussed on the characteristics of materials used in solid propellants and composite explosives, and on the search for new binders. J.A.M.

N75-22254# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 345
28 Mar. 1975 80 p refs Transl. into ENGLISH from various Russian reports
(JPRS-64428) Avail: NTIS HC $4.75

Abstracts of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics are presented. Published details of Soviet space spectaculars are included. Author

N75-22255*# Kanner (Leo) Associates, Redwood City, Calif.
MODERN ACHIEVEMENTS OF COSMONAUTICS
B. Petrov and K. Bushuyev Washington NASA 14 Apr. 1975 71 p Transl. into ENGLISH of the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 1-64
(Contract NASw-2481)
(NASA-TT-F-16221) Avail: NTIS HC $4.25 CSCL 22A

Soviet achievements in space exploration and future areas and means of space research are reported. Summaries are given of: automation and computer technology, instrumentation and preliminary results of Lunakhod 2 operation on the moon, compatibility of Apollo-Soyuz spacecraft docking systems, Prognoz satellite observations, and visual observation of twilight aureole. For individual titles, see N75-22256 through N75-22262.

N75-22256* Kanner (Leo) Associates, Redwood City, Calif. **c54**
AUTOMATION IN SPACE
B. Petrov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 1-4 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 3-6 (For availability see N75-22255 13-99)
CSCL 05/8

The effective use of automatic machines and equipment in space exploration is discussed. Special attention was given to the problem of interacting people and automatic devices. Data are given on computer data processing, planet rovers, and long term orbital stations. E.H.W.

N75-22257* Kanner (Leo) Associates, Redwood City, Calif. **c91**
LUNAKHOD-2 IN LEMONNIER CRATER
A. Koval *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 5-19 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 7-21 (For availability see N75-22255 13-99)
CSCL 22A

A study of surface properties of the Lemonnier Crater by Lunakhod 2 is summarized. Special efforts were made to determine the variations of physical-chemical properties of the lunar surface as a function of the selenological-morphological structure in the transition zone of a mare region to the highlands. Studies were also made of the local magnetic situation, physical-mechanical properties of the soil, and the optical properties of the surface. E.H.W.

N75-22258* Kanner (Leo) Associates, Redwood City, Calif. **c12**
MUTUAL ASSISTANCE IN SPACE
K. Bushuev *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 20-38 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 22-40 (For availability see N75-22255 13-99)
CSCL 22A

Operating principles, system functions, and technological problems associated with developing compatible spacecraft, station approach, and docking facilities between the U.S. and the U.S.S.R. are reported. Two designs, the probe cone and the androgynous docking device are examined. E.H.W.

N75-22259* Kanner (Leo) Associates, Redwood City, Calif. **c91**
LUNAKHOD-2: PRELIMINARY RESEARCH RESULTS
A. Vinogradov and S. Sokolov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 39-50 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 41-50 (For availability see N75-22255 13-99)
CSCL 22A

Results from the Lunakhod 2 experiment on the surface property variations and relief structure of lunar craters are presented. Tectonic fractures, iron composition of lunar rocks, magnetic measurements, lunar sky brightness, and corpuscular radiation of the lunar body were studied. E.H.W.

N75-22260* Kanner (Leo) Associates, Redwood City, Calif. **c46**
THE COLORS OF SPACE
K. Kondratyev, A. Nikolayev, and V. Sevastyanov *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 51-56 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 51-55 (For availability see N75-22255 13-99)
CSCL 04A

Visual observations, as made by cosmonauts; of the earth's surface, physical processes occurring in the earth's atmosphere, and optikal phenomena are discussed. E.H.W.

N75-22261* Kanner (Leo) Associates, Redwood City, Calif. **c92**
PROGNOZ REPORTS
G. Narimanov and N. Pisarenko *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 57-62 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 56-60 (For availability see N75-22255 13-99)
CSCL 03B

Studies conducted outside the effect of the earth's magnetic field during the revolution period by the Prognoz satellite are examined. In particular, the unperturbed solar wind, the flux of charged particles continually given off the sun is studied. Solar activity and its effects on various natural phenomena are discussed. E.H.W.

N75-22262* Kanner (Leo) Associates, Redwood City, Calif. **c32**
RADIO BRIDGES THROUGH THE UNIVERSE

A. Prokhorov and B. Shteynshleyger *In its* Mod. Achievements of Cosmonautics (NASA-TT-F-16221) 14 Apr. 1975 p 63-67 Transl. into ENGLISH from the book "Sovremennyye Dostizheniya Kosmonavtiki Sbornik" Moscow, Znaniye, 1973 p 61-64 (For availability see N75-22255 13-99)
CSCL 17B

The design and operation of quantum amplifiers to detect extremely weak radio signals from space are discussed. Special attention was given to amplifier performance in planetary radar ranging studies, super-long baseline radio interferometry, and remote space communications. Amplifier sensitivity was also examined. E.H.W.

N75-22263# Army Aeromedical Research Lab., Fort Rucker, Ala.
REVIEW OF THE US ARMY AEROMEDICAL RESEARCH LABORATORY CONFERENCE ON AEROMEDICAL EVACUATION HELD ON 15-16 JANUARY 1974
Frank S. Pettyjohn and Eugene L. Nagel Aug. 1974 62 p refs
(AD-A001544; USAARL-75-4) Avail: NTIS CSCL 15/7

The U.S. Army Aeromedical Research Laboratory has supported the helicopter medical evacuation mission throughout its rapid growth. The concept of dedicated evacuation helicopters and crews has been well proven during the Vietnam Conflict. Concurrent with this development has been the rapid emergence of the civilian emergency medical services within the Continental U.S. The utilization of the military helicopter in a joint role with the civilian community, the Military Assistance to Safety and Traffic, as well as in its combat evacuation role requires combined emphasis and upgrading of medical equipment and procedures. GRA

N75-22264# Merchant Marine Academy, Kings Point, N.Y.
SUBMARINE TANKER CONCEPTS AND PROBLEMS Final Report
Patrick Moloney Oct. 1974 195 p refs
(COM-75-10009/9; NMRC-KP-129) Avail: NTIS HC $7.00 CSCL 13J

The National energy crisis of the U.S. can be responded to and diminished by the use of the large deposits of oil in the Arctic. The use of nuclear powered submarine tankers for the transportation of oil from the Arctic regions is discussed. The advantages and disadvantages of the submarine tankers as compared with the conventional methods of transportation such as surface tankers, tug-barges and oil pipe lines are discussed. GRA

N75-22265# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE WINGED SHIELD OF THE MOTHERLAND
18 Nov. 1974 13 p Transl. into ENGLISH from Pravda (Leningrad), no. 230, 18 Aug. 1974 p 2
(AD-A002809; FTD-HT-23-0100-75) Avail: NTIS CSCL 15/3

On the country's airfields, in the workshops of factories in the aviation industry, in the designers' shops, in the aviation sport clubs of DOSAAF (All-Union Voluntary Society for Assistance to the Army, Air Force, and Navy of the U.S.S.R.) a national holiday was celebrated -- U.S.S.R. Air Force Day. GRA

N75-22266# National Bureau of Standards, Washington, D.C.
DIMENSIONS/NBS. VOLUME 58, NUMBER 12, DECEMBER 1974 Monthly Technical News Bulletin
Dec. 1974 25 p
(COM-74-50058-12; NBS/DIM-58/12) Avail: NTIS MF $2.25; SOD HC as C13.58/12 CSCL 05B

A series of articles is presented on research currently in progress at the National Bureau of Standards. Topics discussed include cost-sharing to help clean waterways, energy from wastes, grain alcohol detected in space, screw thread standards--who needs them, measurement science in transition, reduction of earthquake losses sought, test patterns for integrated circuits, guidelines for computer vote counting, cryogenic data, and studies of smoke and gas fatalities. M.J.S.

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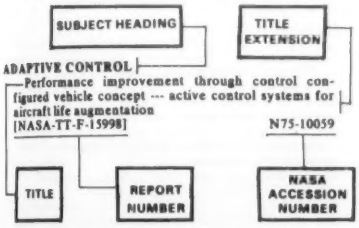
TYPICAL SUBJECT INDEX LISTING



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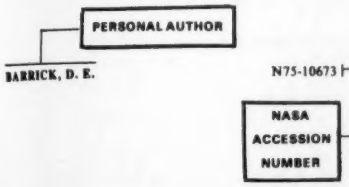

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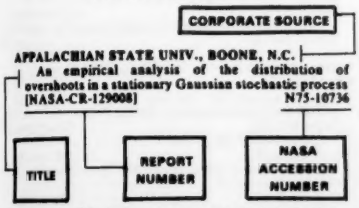
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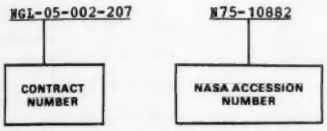

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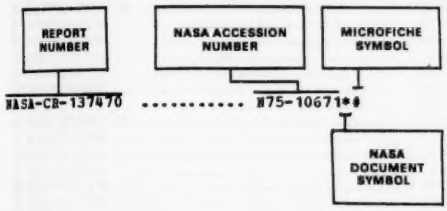

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